SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, MARCH 2, 1906.

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MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

THE NEW ORLEANS MEETING OF SECTION C OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE AND OF THE AMERICAN CHEMICAL SOCIETY.[1]

THE meetings were held in the chemical laboratory of Tulane University. In the absence of C. F. Mabery, the vice-president, Section C was presided over by L. P. Kinnicutt.

At the first meeting the minutes of the preceding meeting at Philadelphia were read by the secretary, Charles L. Parsons. J. H. Long was elected a member of the council of the association, Charles H. Herty as a member of the general committee, W. J. Gies as a member of the sectional committee and C. E. Waters as press secretary.

J. H. Long read the report of the committee on tax-free alcohol for manufacturing purposes. This has already appeared elsewhere in SCIENCE.

In the afternoon the retiring chairman of Section C, L. P. Kinnicutt, delivered an address on 'The Sanitary Value of a Water Analysis.' This has already been published in SCIENCE, January 12, 1906, p. 56.

The American Chemical Society was then called to order by President F. P. Venable. Harvey W. Wiley delivered an address on 'Some Important Problems in Agricultural Chemistry.'

The realm of agricultural chemistry was formerly supposed to be confined to examinations of soils and fertilizers. In late years, however, investigations of agricultural chemistry have extended far beyond the original confines. The term agricul-

[1] December 29 to January 2.

tural chemistry no longer represents a kind of chemistry, but the field in which all kinds of chemistry are utilized.

It is true that there are many problems yet unsolved relating to the source of plant fertility and even to definitions. For instance, the chemists and botanists use the term plant food in a different sense, thus creating more or less confusion.

The chemist regards plant food as that which enters the plant from without and is utilized for its growth and development. The botanist does not regard water and carbon dioxide as plant food, but only as food materials, which do not become real foods until united by photosynthesis.

In this country another problem relates to the supply of potash, which it is possible may yet be obtained by grinding potash-bearing feldspars.

Another problem relates to the composition and nutrition of foods. This problem now occupies the attention of a great many agricultural chemists, who, perhaps, are known also as physiological chemists.

The realm of physical chemistry is important here, since most of the phenomena of plant growth rest upon the principles of physical chemistry. Agricultural chemistry also follows foods through their preparations, and supervises their purity and ascertains their nutritive value.

Agricultural chemistry also has occupied the field of technical chemistry in all the processes which utilize the raw material produced from the field, the forest and the farm. Thus the chemical problems of tanning, paper making, sugar manufacturing, etc., come within the domain of research of agricultural chemists of the present day.

It is thus seen that every department of chemical activity and research may be utilized for the advantage of agriculture.

Dr. Wiley was followed by Louis Kahlenberg, whose address on 'Recent Experimental Researches in Osmosis' will appear in the *Journal* of the society.

On Saturday morning Wm. L. Dudley delivered an address on 'Laboratory Designing and Construction.' His ideas on the subject were illustrated by plans for a chemical laboratory. James F. Sellers followed with an address entitled 'A Symposium on Chemistry Requirements in the South.'

C. A. Browne, Jr., told of 'Recent Developments in Industrial Chemistry in the South.'

The writer restricts his paper very largely to Louisiana. The developments in the fertilizer industry, manufacture of ice, preservation of wood, distillation of turpentine, tar, methyl alcohol, etc., from wood and the utilization of wood waste for the manufacture of ethyl alcohol by Claassen's process are briefly discussed. The utilization of cottonseed by-products in a number of new ways is alluded to, and reference is made to a new process for extracting oil from rice and the improvement of the rice by-products for cattle feeds. The remainder of the paper is devoted to a discussion of recent developments in the sugar cane industry, particular stress being laid upon the recent work in improving the varieties of sugar cane and in the utilization of the by-products of the sugar house —the bagasse and molasses.

The address of the retiring president of the society, F. P. Venable, was on 'The Growth of Chemical Research in the United States.' It will appear in the February number of the *Journal* of the society.

The reports of the secretary, editor and treasurer were next read. The membership of the society is now 2,919, a net gain of 244 members. A new local section has been organized in Iowa and also one in western New York. An application for a local section in Minnesota is pending.

During the year 197 papers were submitted for publication, only 33 of which were unsuitable for the *Journal*. Reviews on different branches of chemistry were published. The total number of pages in the *Journal*, including the 'Review of American Chemical Research,' was 2,361.

The treasurer's report showed the financial affairs of the society to be in a satisfactory condition.

The officers for 1906 are:

President—W. F. Hillebrand.
Vice-Presidents—The presiding officers of the local sections.
Secretary—Wm. A. Noyes.
Treasurer—A. P. Hallock.
Librarian—E. G. Love.

The report of the librarian was followed by the report of the committee on uniformity of technical analysis. This will appear in the February number of the *Journal* of the society.

At the meetings of the different sections the following papers were presented on Saturday:

PHYSICAL CHEMISTRY.

Louis Kahlenberg, chairman.

The Antimony-Tin Alloys: W. D. BANCROFT.

Reinders thought that antimony and tin formed two series of solid solutions and two compounds. It is now found that no compounds occur and that there are four series of solid solutions. The β crystals, counting from the antimony end, are unstable below 309°. The paper will be published in the *Journal of Physical Chemistry*.

Amorphous Sulphur: ALEXANDER SMITH and R. H. BROWNLEE. (By title.)

The Thermochemistry of Chemical Combination: J. W. RICHARDS.

The paper discussed the real heat representing chemical combining energy, and one conclusion was that in order to eliminate from the measured heat of combination all physical heat effects, the reaction should take place from solid constituents to the gaseous products; because if liquid or gaseous constituents are brought together, the heat evolved will contain their latent heats of fusion or vaporization, and if the product condenses to the liquid or solid state, the heat evolved will contain its latent heat of vaporization or sublimation. The real chemical heat of reaction is that of solid constituents to gaseous products at the absolute zero. The heat of reaction at any other temperature is then equal to

$$Q_T = Q_0 + T \quad (S_m \text{ constituents} - S_m \text{ products}),$$

where Q_T is the heat of the reaction at any absolute temperature T, Q_0 the true heat of chemical combination at the absolute zero, S_m the mean specific heat from absolute zero to T. Another way of expressing this is the well-known Helmholtz formula

$$Q_T = Q_0 + T\frac{dQ}{dT},$$

where the differential coefficient represents the *mean* variation of Q with changing temperature between absolute zero and T.

The paper further discussed the great thermochemical generalization that the heat of formation of salts taken to dilute solution is additive, and concluded therefrom that (1) a salt in dilute solution is in a condition closely analogous to the gaseous state, (2) that the phenomena of osmotic pressure also substantiate this view, (3) that since for this condition the first great generalization of the thermochemistry of chemical combination has been discovered, and applies with exactness, that, therefore, the state of being in dilute solution is without question the most uniform and complete state of chemical combination known,

thus absolutely debarring any idea of dissociation in any sense whatever.

The paper concludes with a careful discussion and tabulation of the most probable values of the thermochemical constants of bases and acid radicals, on the arbitrary basis of hydrogen gas being zero.

The paper should be published in the *Journal* of the society.

On the Specific Inductive Capacity of Solutions of the Oleates of the Heavy Metals: Louis Kahlenberg.

The Separation of Solutes from Solvents by Absorbing Media: F. K. Cameron and J. M. Bell.

Examples of the separation of organic solutes (dyes) from water or from one another, their separation from inorganic substances, and the selective absorption of ionized products were given. The absorbing media principally used were blotting papers, cotton and soils. A specially interesting case on account of its wide practical significance, was the absorption of the base from blue litmus test papers or solutions, leaving the residue apparently acid. An important practical feature of such separations is the relative rates at which solutes move capillarily through the absorbing media. It was found that such movements followed an empirical law, $y^n = kt$, where y represents the distance through which the movement has taken place, t the time of movement and n and k constants depending on the nature of the substances used, although n approximated 2.3 in most of the cases to which the formula has so far been applied. While this formula appears to hold remarkably well when neither the distance nor time is large, it ceases to hold whenever one of the variables assumes any considerable magnitude as in the cases so far recorded in the literature. For instance, the movement of water in soils has generally been measured at intervals of many hours or days, and through secondary gravitational or possibly other effects this formula ceases to hold. For the study of separations, however, the formula gives promise of much usefulness.

Molecular Absorption: F. K. Cameron and B. E. Livingston. (By title.)

The Absorption of Potassium by Soils: Oswald Schreiner and G. H. Failyer.

The absorption of potassium by soils has been studied in a manner identical with that of the phosphate. As far as investigated the potassium absorption can be represented by the equation

$$\frac{dy}{dv} = K(A - y),$$

where K is a constant, A the maximum amount of potassium the soil can absorb under the conditions of the experiment, and y the amount it has absorbed when the volume v of potassium solution has passed through the soil. The removal by water of the absorbed potassium is rapid at first, but the concentration of the percolates soon reaches a constant value, although only a fractional amount of the absorbed potassium has been removed. As far as the observations have been made the solutions obtained by percolating a solution of potassium chloride through the soil have always been acid.

The Absorption of Phosphate by Soils: Oswald Schreiner and G. H. Failyer.

In view of the importance of the subject to a proper understanding of the chemistry of the soil and of soil solutions, a systematic study of the behavior of several soil types toward different phosphates was made. The phosphate solution was percolated through the soil at a slow and constant rate in an apparatus especially designed for this purpose. The separate fractions were then analyzed for phosphate and thus the amount absorbed by the soil

determined. The graphical representation of the results indicates that the soils are approaching a saturated condition for phosphate, as is shown by the fact that each curve is evidently approaching a horizontal asymptote. It has been found that these absorption phenomena are quite accurately described by the differential equation

$$\frac{dy}{dv} = K(A - y),$$

which is of the same form as the equation for a reaction velocity of the first order and other analogous processes. Integrating we get

$$\log (A - y) - \log A = - Kv,$$

where K is a constant, A the maximum amount of phosphate the soil can take up under the conditions of the experiment, and y the amount it has taken up when the volume v of the phosphate solution has passed through the soil. A may, therefore, be defined as the specific absorptive capacity of the soil for phosphate. This absorptive capacity for phosphate varies greatly in different soils, being most pronounced in the clays and loams as a rule and less so in the sandy soils. The solubility of the phosphate originally present in the soils was also determined by percolating water through the untreated soils in the above-mentioned apparatus. It was found that the concentration of the separate fractions of percolate was practically a constant for each of the soils studied. If this concentration is reduced through any cause, such as the absorption by plants or influx of rain water, the original concentration will be again restored by more of the phosphate of the soil entering into solution. If, on the other hand, the solution is somewhat stronger than the natural concentration for that soil through any cause whatever, such as the application of a soluble phosphate, the concentration is reduced by absorption to the original strength. This is strikingly shown by the absorption results with the first few hundred cubic centimeters of phosphate solution. This constancy in the strength of the soil solution, so far as phosphate is concerned, is further shown by the removal by water of the absorbed phosphate, which has been similarly investigated. It was found that the concentration of the separate percolates decreases rapidly until the concentration is reduced approximately to that of the original soil solution. This concentration of phosphate is then maintained with much persistence, although only a fractional amount of the absorbed phosphate has been removed, thus indicating that while the absorbed phosphate is apparently rendered insoluble, it is, nevertheless, slowly but constantly going into the soil moisture and is, therefore, available to plants.

Citric Acid: F. L. KORTRIGHT.

A discussion of various unsuccessful attempts to make anhydrous citric acid according to the method of Buchner and Witter, was followed by a description of two methods used in getting the equilibrium relations between citric acid and water. The cryohydric point of the monohydrate and water, the transition point of the monohydrate to the anhydrous acid, and the transition point of one form of anhydrous acid to another, have been determined. The work is to be continued.

The Action of Metals on Complex Cyanides in Aqueous Solution: G. MCP. SMITH. (By title.)

Electrolysis and Endosmosis in the Study of Rock Decomposition: A. S. CUSHMAN. (By title.)

AGRICULTURAL AND SANITARY CHEMISTRY.

H. W. Wiley, chairman.

Filtration and Purification of the Mississippi River Water at New Orleans: J. L. PORTER. (By title.)

A Method for the Determination of Small Amounts of Copper in Water: E. B. Phelps. (By title.)

A Trade Waste Study: Copper Salts in Irrigation Waters: W. W. Skinner. (By title.)

The Availability of the Phosphoric Acid of the Soil: G. S. Fraps.

The various factors which influence the amount of phosphoric acid dissolved by solvents are considered—nature of the soil phosphates, solution of soil constituents thereby exposing more phosphoric acid, fixation by the soil, and availability of the dissolved phosphoric acid. These factors appear to exclude the use of water, carbonated water, one per cent. acetic acid and $N/200$ hydrochloric acid. Soils must be divided into different classes according to the solubility of their constituents.

There is a relation between the chemically available phosphoric acid and soil deficiency in phosphoric acid, according to pot tests on a number of soils. The action of the plant makes available a considerable amount of phosphoric acid. Cotton and cow peas have a higher solvent power than rice or corn, corn being very low. Though cow peas and cotton take up nearly equal quantities, the soil was deficient for cotton and not for cow peas, showing that cotton requires more. With a given amount of chemically available plant food, the soil may be deficient for one crop and not for another with higher solvent power or lower needs.

The Effect of Climate on the Composition of Cotton Seed: G. S. Fraps.

From observations during two seasons, meal from the western part of the state appears to be much richer in nitrogen than meals from eastern Texas. The climate of the former section is semi-arid. No close relation could be traced between the rainfall and distribution of the meal. Texas meal appears, on the average, to be richer than meals from other sections.

On the Presence in Soils and Subsoils of Substances Deleterious to Plant Growth: W. K. Cameron and B. E. Livingston. (By title.)

The Fermentation of Sugar-Cane Products: C. A. Browne, Jr.

In the first part of the paper the writer discusses the influence of the various enzymes of the sugar cane upon the composition of the juice. The action of invertase in windrowed cane, the coloration phenomena produced by oxydases, and the physiological importance of the oxydases and catalases in the matter of protection against microorganisms are briefly presented.

The second part of the paper is devoted to a description of a few typical fermentations produced by bacteria, yeasts and molds, in cane juices, syrups and molasses. Particular attention is paid to the different compounds, dextran, mannite, cellulose, chitine, fat, etc., produced by these organisms and the influence of these upon the composition of the cane products is discussed. The writer concludes by noting the bearing which several of these compounds, such as glycerol and acetyl-methyl-carbinol, have upon the physiology of certain fermentations.

The Quantitative Estimation of Salicylic Acid: W. D. Bigelow and W. L. Dubois.

This paper is an attempt to define as exactly as possible the conditions to be followed for the estimation of salicylic acid by extracting with organic solvents and comparing the color given by treating the extracted salicylic acid with ferric solutions, with solutions containing a known amount of salicylic acid. The errors most frequently made in the use of the method

are pointed out and exact conditions for its use prescribed.

The results obtained on uniform samples by twelve collaborating chemists using miscellaneous methods and also using the method suggested by the writers, are given. It is demonstrated that with proper precautions results can be obtained which are reasonably accurate.

The Estimation of Hydrocyanic Acid in Cassava: C. C. MOORE. (By title.)

The Artificial Coloring Matter in Whiskey: P. H. WALKER and J. H. A. SCHREIBER.

A series of tests for artificial coloring matter in whiskey were described and a summary of results on a very large number of whiskies, both pure and artificially colored, discussed.

A Uniform Method for the Determination of Reducing Sugars: P. H. WALKER.

The same solutions and manipulations are used in the determination of both dextrose and invert sugar. The alkaline tartrate solution is the same as Soxhlet's; but the copper solution contains 40 grams of crystallized copper sulphate to 500 c.c. Adhering to the directions given, the values for varying amounts of dextrose and invert sugar were determined and a table prepared showing the weight of cuprous oxide, dextrose and invert sugar corresponding to each milligram of copper from 10 to 466.

The Extraction of Tanning Materials for Analysis: F. P. VEITCH and H. H. HURT. (By title.)

The Ripening of Oranges: W. D. BIGELOW and H. C. GORE.

This work is in connection with the systematic study being made by the writers, of changes that occur in fruit during its growth and ripening. The oranges increased in actual weight of total solids and sugars from the beginning to the full maturity of the fruit. At all stages of the growth of the fruit, the total sugars are divided about equally between reducing sugar and sucrose. The marc of the orange is formed very early in its history and remains constant in weight during its growth and development. The acids are also formed at an early stage and apparently increase gradually but almost imperceptibly.

Storage of the fruit at all stages of its development results in slight loss of total sugar, a marked increase of reducing sugar, and a corresponding loss of sucrose. The loss of total sugar noted above is to be explained as in the case of apples, by the consumption of reducing sugar as a result of the respiration of the fruit. The weight of marc remains practically constant and the weight of acid appears to decrease slightly on storage during the various stages of the development of the orange.

The Growth and Ripening of Persimmons: W. D. BIGELOW, H. C. GORE and B. J. HOWARD.

This paper is a partial report on the systematic study of the ripening of fruits which is being conducted by the writers. In the other fruits thus far studied, the quantity of tannin was so low as to preclude any deductions from the results obtained at various stages of their growth. The persimmon was selected largely because of its content of a relatively large amount of tannin.

The weight of the pulp increases steadily during the entire period of observation and a marked increase was also noted in the case of total determined solids, sugar and marc. The sugar was found to consist almost entirely of invert sugar. The amount of sucrose is apparently almost within the limit of analytical error. The percentage of acids is also very low. During a later portion of the period of observation, the tannin was found to decrease in

proportion to the increase in the weight of the marc.

The results obtained by the writers prove beyond a doubt that the tannin is not decomposed and does not actually disappear in the ripening of the fruit, but that it is converted into an insoluble form within certain specialized cells. No evidence was found of the combination of tannin with any other body in the formation of this insoluble compound. It apparently goes into insoluble form without entering into combination with any other substance.

At each date of picking sub-samples were ripened in the laboratory as in the case of fruits previously studied by the writers. The changes occurring on storage were similar to but more rapid than those occurring in the natural ripening of the fruit. Decreases are found in the solids and sugar of the stored fruit while the weight of marc in the fruit is found to increase owing to the tannin becoming insoluble.

INDUSTRIAL CHEMISTRY.

S. W. Parr, chairman.

The Cotton Oil Industry of the South: David Schwartz.

An interesting account of some of the methods used in purifying cotton oil, illustrated by samples of the seed, the crude and purified oil and some of the by-products. This will appear in full in the March number of the *Journal* of the society.

A Comparison of Methods used in Determining Total Soluble Bitumen in Paving Material: L. Avery. (By title.)

The Durability of Cement Plaster: E. H. S. Bailey.

The material sold as cement plaster is made from the gypsum dirt, or 'gypsite,' which occurs throughout many of the states of the central west, in patches of a few score of acres, by heating in a kettle to drive off most of the water of crystallization. This material, mixed with sand, is used in the place of lime mortar for plastered walls. In addition to the calcium sulphate and water, it contains considerable calcium and magnesium carbonates, silica and oxides of iron and aluminum.

A peculiar case of disintegration of the plastered wall of a room in which there was a fan blower for ventilating and warming the building, was investigated. It was noticed that in the upper part of the room the plaster crumbled and fell. The analysis of the hard plaster and of that which had fallen showed that the fallen plaster contained about 2 per cent. of moisture, while the hard plaster contained 4.5 per cent. This would indicate that the air which was heated by passing over steam pipes as it came into the fan room, had its capacity for absorbing moisture so much increased that it removed the water from the plaster of the wall, and so the crystals of gypsum disintegrated, and the plastering fell.

(Published in full in the *Trans. Kans. Acad. Sci.*, Vol. XX.)

Note on Sampling and Analysis of Coal: A. Bement.

Laid stress on the need of painstaking care in preparing samples of coal for analysis, in order to obtain reliable results.

The Examination of Writing Inks: L. S. Munson.

The paper gave the results of examination of a number of writing inks, made for the purpose of determining the suitability of these inks for record purposes.

Standard Samples of Iron and Steel: J. R. Cain.

A brief statement was made with regard to standard samples of iron and steel which can now be furnished by the Bureau of Standards at Washington, and charts show-

ing analyses of these samples by different well-known chemists were exhibited.

A Study of the Lignites of the Northwest: G. B. FRANKFORTER and E. P. HARDING. (By title.)

A Description of Improved Apparatus and of a Modification of Drehschmidt's Method for the Determination of Sulphur in Illuminating Gas: E. P. HARDING. (By title.)

Notes on Typewriter Ribbons: A. M. DOYLE. (By title.)

The American Chemist and the Gas Industry: H. B. HARROP. (By title.)

On Saturday afternoon there was an excursion across the Mississippi to see the New Orleans Acid and Fertilizer Works at Gretna. In the evening there was a general reception of the association in the Palm Garden of the St. Charles Hotel. On Sunday morning some of the chemists visited a sugar plantation some miles from the city.

On Monday morning there was another session of Section C. In the absence of C. F. Mabery his address was read by Charles E. Coates. It was entitled 'The Composition of Petroleum from American Fields—Pennsylvania, Ohio, Texas, Kansas, Wyoming, Colorado, Kentucky and California.' It will appear in full in the March number of the *Journal* of the society.

S. W. Parr delivered an address on 'The Service Waters of a Railway System.' Numerous tests to determine the loss of efficiency due to scale having an average thickness of one eighth inch agree in showing approximately ten per cent. increase in fuel consumption. On the basis of a total annual cost for fuel of $1,500,000, and assuming the average condition of the locomotives as fifty per cent. better than the above the loss due to this cause aggregates $75,000. This expense is duplicated by another which would represent approximately the cost of overhauling and repairs chargeable directly to the presence of scale. We thus have a sum representing the annual interest on an investment at five per cent. of $3,000,000. This takes no account of accidents or disasters, due more or less directly to the use of poor water. At least five principal railway systems of the middle west have in operation, or are in process of installing, purification plants for the treatment of their service waters. This marks a decided advance over the condition of ten years ago, when in the same region no such plant was in existence.

Concerning treatment within the boiler itself, while this method is often applicable to stationary boilers, in the case of locomotives the construction and exigencies of service make such methods inadvisable.

The usual method of rating a water with reference to its scaling ingredients is no longer applicable. New types of water are now common, which involve entirely different properties, such as foaming and corrosion. For example, some twenty-five samples of water have been examined from Cairo to New Orleans on the lines of the Illinois Central Railway having less than fifty parts per million of scaling matter (three grains per gallon).

Two marked characteristics are present in these waters aside from their very low amount of scaling matter. One is the high content of organic matter and the other is the presence of free sodium carbonate. In general the first type includes the waters from streams or bayous and shallow wells, while the second characteristic is present in those samples from wells from 100 to 800 feet in depth, one well, indeed (at Hammond, La.), having a depth of 2,100 feet.

With these waters two problems, other than that of scaling, present themselves—first, corrosion, and second, foaming. A

number of experiments were detailed, indicating the conditions which promote the corrosion of iron. As nearly as possible, the conditions existing inside a boiler were reproduced, using an autoclave, within which were placed vessels containing samples of iron submerged in various solutions and the whole maintained at 100 pounds steam pressure.

Briefly stated, the results showed active corrosion to occur in presence of organic material, especially the tannins, also when oxygen or carbon dioxide was generated with the steam, as well as with the well-known conditions where salts of calcium or magnesium nitrate or chloride were present. These results readily explain the cases of corrosion met with in these southern waters. The other difficulty, that of foaming, occurs in general when the alkalies of whatever sort are present to the extent of fifty grains and over per gallon. But this difficulty is greatly accentuated by the presence of free sodium carbonate and for the reason, as seems evident from experience, that the finely divided precipitate which results, in conjunction with the free alkali, are the chief elements in the promotion of foaming.

Along the same line is the explanation for foaming when the use of a water containing free alkali is followed by the addition of a turbid water, like that of the Mississippi River.

The very extended use for sanitary reasons in the regions farther north, of deep well waters has revealed the fact that this type of water having from three to fifteen grains per gallon of free sodium carbonate is distributed over very wide areas and brings into prominence their behavior when applied to locomotive use.

It is thus seen that the problems connected with railway service are altogether different from those that attend the use of stationary boilers. They involve no very profound chemical principles and perhaps on that account have received little attention, but the industrial importance of the matter is very great and if for no other reason the subject may be worth noting here as an illustration of an improved and more healthy state of affairs in the industrial world, which shows itself in giving attention to wastes and greater care in small economies. When we acquire, and there are many indications that we are attempting, the habit of looking after all possible wastes and losses from principle, the profits are more sure to look out for themselves.

This will appear in full in the *Journal of the American Chemical Society.*

W. D. Bancroft delivered an address on 'The van't Hoff-Raoult Formula.'

The apparent osmotic pressure depends on the molecular weight of the solute and on the heat of dilution. If the latter is zero, as at infinite dilution, the apparent and the theoretical osmotic pressures coincide. If the addition of one liter of solvent to one liter of a normal solution causes a heat effect of one gram calorie, the apparent molecular weight of the solute may be ten per cent. in error at 0°. In all cases in which there is a marked evolution of heat on diluting the solution, the apparent molecular weight will decrease with increasing concentration. Instances of this are sodium in mercury, resorcinol in alcohol, sulphuric acid, caustic potash, or cupric chloride in water. The abnormal behavior of sodium chloride in concentrated aqueous solution is due to another cause. The paper will be published in the *Journal of Physical Chemistry.*

After this the meetings of the sections were resumed.

BIOLOGICAL CHEMISTRY.

Wm. J. Gies, chairman.

Investigations on Salts of Casein: J. H. Long.

The Relation of Carbon Dioxide Excretion to Body Weight: G. O. Higley.

The Relation between Barometric Pressure and Carbon Dioxide: G. O. HIGLEY.

The Separation of Proteoses and Peptones from the Simpler Amido Bodies: W. D. BIGELOW and F. C. COOK.

The paper gives the results of the examination of several methods that have been employed for the purpose mentioned. It was found that the Sjerining method, employing a solution of tannin and sodium chloride, gave the most satisfactory results, but much better results could be secured by increasing the amount of both tannin and sodium chloride in the reagent. The maximum results were obtained when the proteid bodies were precipitated in a solution containing 15 grams of sodium chloride and 5 grams of tannin per 100 c.c.

The claim of earlier writers that an excess of tannin has a solvent effect on the precipitate was not confirmed, although solutions containing 7.5 grams of tannin per 100 c.c. were employed. It was found that when the precipitation and filtration were conducted at from 12° to 15° C. much more satisfactory results were obtained, and clear filtrations were much more readily secured than in the case of room temperature.

Attention is called to the fact that the precipitating power of various preparations of tannin is not quite uniform, and it is suggested that a uniform tannin be used in the prosecution of any particular investigation. It is also essential that correction be made for the nitrogen content of the tannin employed as reagent and that blanks be run with the reagent in order to determine the amount of nitrogen precipitated from the tannin of the tannin-salt solution. Attention is called to the fact that tannin undergoes fermentation and loses to a large extent its power of precipitating proteids. The reagent should, therefore, be kept in a cool place and for not more than a few days at a time.

The effect on a number of amido bodies of a solution containing 15 grams of sodium chloride and 5 grams of tannin was also studied. No precipitation was obtained with glycocoll, alanine, glutamic acid, aspartic acid, allantoin, asparagine, betaine, creatinine, glutamine, guanine, xanthine, hypoxanthine, leucine, diphenylamine, acetamide and sarcosine. Precipitates were obtained with creatine, trimethylamine and phenylenediamine. It is probable that phenylenediamine and trimethylamine do not occur in meat, but the latter is found in considerable quantity in fish and in beet root. The error occasioned by the partial precipitation of creatine may be corrected by determining creatine, before and after the precipitation with the tannin salt solution, by means of Folin's method for the estimation of creatine in urine.

The Influence of Salicylic Acid on the Excretion of Urea and Uric Acid, and a Comparison of the Mörner-Sjiqvöst and Braunstein Methods for Determining Urea: F. C. WEBER.

The Influence exerted by Chemical and Physical Agents on the Virulence and Speed of Development of Mouse Tumors: G. H. CLOWES.

The Effect of the Rays of Radium on Plants: C. S. GAGER.

Experiments of the writer show that the rays of radium and of other radioactive substances, such as radio-tellurium and thorium, act as a stimulus to the various life processes of plants. There are doubtless minimum, optimum and maximum points, depending upon the strength of the radium preparation, the distance and time of exposure, and the intervention of substances more or less opaque to the various rays. The quantitative determination of these points has not yet been made.

When seeds, either dry, or during the imbibition of water, are exposed to radium

bromide of 1,500,000 and of 10,000 activity in a sealed glass tube, for twelve hours or more, germination and subsequent growth are retarded. If the same radium preparations are inserted in the soil in pots containing germinating seeds, there is a decided acceleration of germination and growth. In such plants there is a marked increase in the number and length of root-hairs.

When plants are grown under a bell-jar containing decaying radium emanation drawn from a hollow tube lined with Lieber's radium coating, germination and growth are either retarded, completely inhibited, or acceleratel, according to the amount of the emanation supplied, and the duration and distance of exposure.

When the stimulation is of such intensity as to accelerate growth, the rate of growth at first increases, and then gradually decreases until it falls below that of the control plants.

Marked anatomical changes are effected by exposure to the rays, the cross-section of the stem of a radiated plant, for example, showing no signs of cambium.

Respiration and alcoholic fermentation may be accelerated. By strong exposure chloroplasts in the cell take up a position similar to that assumed under intense sunlight, and eventually the radiated portion becomes etiolated.

It is hoped to be able still further to study the effect of the rays on cell activities by means of radioactive microscopic slides now being prepared at the writer's suggestion by Mr. Hugo Lieber, of New York. Grateful acknowledgment is here made of Mr. Lieber's liberality in supplying some $2,000 worth of radium preparations, without which these experiments would not have been possible.

Experiments to Determine the Effects of Radium on Minute Animals: L. Hussakof.

These experiments were intended primarily to show the influence, if any, of radium rays on the protoplasm of *Amœba proteus*. Other microorganisms (*Vorticella, Paramœcium,* etc.) were also subjects of experiment. Radium bromide preparations of 600, 1,000, 10,000 and 1,500,000 activity (in thin glass tubes) were used, and several celluloid rods covered with Lieber's 'radium coatings' of 10,000 to 25,000 activity were also employed. The radium container was held in the water within from 1 mm. to 3 mm. of the organism under observation.

Under these conditions no visible effects were produced, by even the strongest radium preparations, during periods of observation of about an hour. The water surrounding the animal may have prevented radiant effects.

The Effects of Intravenous Injection of Radium Bromide in Dogs: R. B. Opitz and G. M. Meyer.

The paper dealt principally with effects on circulation and respiration. Light ether narcosis was employed. With radium bromide of 240 and 1,000 activity there was a marked rise in blood pressure, caused by a general vaso-constriction, followed by a marked decrease in the frequency of the heart, causing fall in pressure. These effects are the same as obtained with pure barium bromide. With radium bromide of 10,000 activity there was a much less noticeable initial vaso-constriction, and the short forcible contractions of the heart which caused the pressure to rise suddenly in jerks beyond any ordinary level, are now succeeded by slow pulsations. The blood pressure thus remained below normal. A moderate decrease in the frequency and depth of respiration was noted.

The Radioactivity of the Organs of Dogs after Administration of Radium Bromide: G. M. Meyer.

The organs were incinerated in a porcelain dish and tested for radioactivity by means of a quadrant electrometer. With injections of radium bromide of 240 activity only the blood was radioactive. If injections are made for several days and time is given for the radium to be eliminated, the blood is no longer active, though the kidneys, urine and feces are. With radium of 10,000 activity most of the organs were radioactive. There was considerable salivation and the saliva was active. Though the radium is excreted through the kidneys and intestines, the latter do not become radioactive.

Experiments to Determine the Influence of Radium Bromide on Protein Metabolism in Dogs: W. N. BERG and W. H. WELKER.

The experiments are being carried out on dogs in nitrogenous equilibrium. Radium bromide preparations of 240, 1,000 and 10,000 activity have been employed. One animal (6.6 kilos) has been fed 1.100 gms. 240 activity, 0.250 gm. 1,000 activity, and 0.125 gm. 10,000 activity in small amounts daily (during twelve days), without causing any gross symptoms, except diarrhœa during the period of administration of the preparation of 240 activity with its large content of barium. Proteid metabolism did not appear to be materially affected. Total sulphate (SO_4) in the urine was markedly increased, especially during the period following the administration of the preparation of highest activity, and when diarrhœa as well as constipation was entirely absent.

In control experiments with barium bromide, much larger quantities *per os* (as much as 0.5 gm. daily to a dog weighing only 4.5 kilos) were without any gross symptoms whatever. In the case of barium, also, proteid metabolism was practically unaffected by the quantities used. The quantity of total sulphate in the urine, unlike the result with radium, appeared to be practically unaffected by the barium bromide.

Injection (subcutaneous) experiments have also yielded negative results.

The Cutaneous Excretion of Nitrogenous Material: F. G. BENEDICT.

During rest, there is an average excretion in the perspiration of 0.071 gram of nitrogen per day. That it is in large measure urea or ammonium compounds is highly probable, though the presence of soluble proteids is not at all impossible. With hard muscular labor the amount of nitrogen excreted may amount to 0.22 gram in one hour. The amount excreted is roughly proportional to the work done. In accurate metabolism experiments these amounts should be taken into account.

The Incapacity of the Date Endosperm for Self-digestion: R. H. POND.

The conclusion drawn from a number of experiments conducted under varying conditions is that the endosperm of *Phœnix dactylifera* is incapable of autodigestion.

The Influence of Aluminium Compounds on the Growth of Lupin Seedlings: H. D. HOUSE and WM. J. GIES.

Aluminium sulphate, nitrate and chloride, aluminium sodium chloride and potassium and ammonium alums were used. In nearly all cases little or no effect was produced by solutions of 1/65,536-molecular concentration, but at greater concentrations growth was usually markedly inhibited. At greater dilutions there was usually a stimulation to growth.

Studies on the Banana: L. B. MENDEL and E. M. BAILEY.

The behavior of green bananas subjected to various abnormal atmospheres and to inert surface coatings has been studied with reference to the effect on ripening

processes. Chemically considered the phenomenon of normal ripening is essentially an almost complete conversion of a large store of starch into soluble carbohydrate, attended by a decrease in the total carbohydrate. Failure to effect this chemical change, together with an absence of characteristic color changes of the peel, is taken as evidence of non-ripening. Bananas placed in atmospheres (hydrogen, carbon dioxide, illuminating gas) in which available oxygen was lacking failed to produce notable amounts of soluble carbohydrate, or to show any considerable decrease in total carbohydrate, the same being true when they were enveloped by an inert surface coating such as paraffin. Furthermore, the respiratory products of the fruit appeared to effect an inhibitory action upon its healthy development and ripening. Two experiments with an atmosphere of oxygen indicated that this gas somewhat accelerated ripening processes. These studies were preliminary to an attempt to detect and isolate enzymatic agencies which may be present. Autolyses with the green pulp, or the green pulp and scrapings of the inner surfaces of the peel, or of the partially ripened pulp, carried out with toluene water under varied conditions, have yielded negative results. The investigation is being extended in various directions.

The Action of Eosin upon Tetanus Toxin and in Tetanus: S. Flexner and H. Noguchi.

1. Eosin and certain other aniline dyes have the power of destroying *in vitro* the hemolytic property of tetanus toxin.

2. Eosin when used in sufficient quantity destroys tetano-spasmin *in vitro*.

3. Simultaneous injection of tetanus toxin and eosin into rats delays or prevents the appearance of the symptoms of tetanus. When the symptoms appear they progress more slowly than in control animals.

4. Spores of tetanus bacilli when introduced in threads into rats together with immediate eosin injections, do not produce tetanus. The treatment of animals with eosin, after the first appearance of the tetanic symptoms following spore-infection, may prevent the further developments of the symptoms of tetanus. Eosin injections into the same locality as spore inoculations are the most effective, but injection into other parts of the body delays or modifies the tetanus process.

5. Rats are more resistant to tetanus than guinea-pigs, and hence are more easily protected by eosin from tetanus poison. But in guinea-pigs the fatal issue can be delayed by eosin.

The Action of Eosin and Erythrosin upon Snake Venom. H. Noguchi.

1. The hemolytic principles of venom react differently to eosin depending upon their native labilities. The hemolysin of *Crotalus* venom suffers most; that of *Daboia* next, while that of *Cobra* is most resistant.

2. The toxicity of different venoms is more or less diminished by eosin in the light. *Cobra* is least affected; *Crotalus* and *Daboia* venoms are most affected. *Crotalus* venom loses its toxicity chiefly by destruction of hemorrhagin; and *Daboia* by destruction of coagulin.

3. Neurotoxin is little or not at all affected by eosin or erythrosin.

4. There is a parallel between the susceptibility of the toxic principles of snake venom to fluorescent anilines and their susceptibility to other injurious influences. Hemorrhagin and coagulin are less stable at high temperatures than neurotoxin, and more easily destroyed by acids than neurotoxin and hematoxin.

On the Decomposition of Purine Bodies by Animal Tissues: P. A. Levene and W. A. Beatty.

The authors aimed in this work to study the products of decomposition of purine bodies in the tissues. Jones, Schittelhelm and Levene have observed that aminopurines are transformed into oxypurines. It is well known that purine bodies undergo complete destruction in the course of tissue autolysis.

The authors have studied the conditions most favorable for the process of purine decomposition by animal tissues and have endeavored to ascertain the general nature of the substances formed during the process. It was found that the presence of 0.5 per cent. of sodium carbonate in mixtures of spleen pulp facilitated the decomposition of purine bodies to such an extent that even uric acid is broken up by that tissue. It was also noticed that the decomposition products were non-basic in nature, for they were not precipitated by phosphotungstic acid. On decomposition of uric acid by tissue extracts, formation of ammonia could not be detected.

On the Biological Relationship of Nucleoproteid, Amyloid and Mucoid: P. A. LEVENE and JOHN A. MANDEL.

The authors endeavored to ascertain the nature of the carbohydrate groups in the proteid molecule. It was found that by heating nucleoproteid on a water bath with a 5 per cent. solution of sulphuric acid, a product could be obtained that had the properties of a polysaccharide or of a glucosoid and which contained in its molecule a small proportion of sulphuric acid (S = 0.5 per cent.). On treating nucleoproteids with alkali, substances were obtained containing a much greater proportion of sulphuric acid (S = 3.5 per cent.; N = 8.8 per cent.). The substances thus obtained were found to possess the properties of glycothionic acids containing small quantities of nucleic acid.

Glycothionic acid has hitherto been recognized as a constituent of mucoid and amyloid. The results of this investigation place the three groups of substances in genetic relationship.

Contributions to our Knowledge of the Chemistry of Carbamates: J. J. R. MACLEOD and H. D. HASKINS.

A description of a method for the quantitative determination of carbamates, even in the presence of soluble carbonates and ammonium salts. Also a study of the formation and stability of carbamates under these conditions.

The Effect of Alcohol on the Secretion of Bile: WM. SALANT.

With dogs there is a diminished secretion of bile following intravenous injection of alcohol. There was also a decrease in the organic and inorganic constituents, though little change in their relative amounts. When alcohol was injected into the stomach there was from 30 to 365 per cent. increase in the amount of bile. The solid constituents were also markedly increased, in one case as much as 132 per cent. The increase in inorganic matter did not keep pace with the organic matter excreted.

The Relation between the Concentration of Hydroxyl Ions and the Rate of Tryptic Digestion in Dilute Solutions of Various Bases: W. N. BERG.

Experiments were made in which the speed of tryptic digestion, in solutions of various bases, which contained the same concentration of hydroxyl ions, was measured.

The results seem to show that the speed of tryptic digestion is a function of the concentration of hydroxyl ions; but the accompanying action and non-ionized molecules also affect the speed. In the solutions of the bases used the speed was fairly uniform when the concentration of hydroxyl ions was the same.

On the Decomposition of Thymus Nucleic Acid by an Extract of Pig's Spleen: Walter Jones.

1. Fresh dog's spleen converts guanine into uric acid, the ferments of this spleen not being different from those of ox spleen.

2. By the action of an aqueous extract of pig's spleen on thymus nucleic acid guanine is produced in considerable quantity; xanthine, not at all.

Concerning Peptone: L. B. Stookey.

This paper is a continuation of a study of peptone carried out in the laboratory of Professor Hofmeister. One of the fractions, designated as 'I B Benzoyl Chloride γ' has been investigated further. This substance gives the following reactions: Biuret, Molisch and an extremely faint xanthoproteic. Hopkins and Millon are negative. Sulphur is not present. Five grams were boiled with five per cent. sulphuric acid until the Biuret reaction disappeared. A residue remained. This residue gave the Molisch reaction more intensely than the original substance. It is not impossible that the residue was glucosamine benzoyl chloride. The filtrate was examined in the usual manner. Neither arginine nor histidine could be detected. Lysine was present and was identified as the picrate. Neither aspartic nor glutamic acid could be found. Alanine was isolated and identified as a copper salt. On account of the small amount of substance examined, these findings can not be looked upon as conclusive; yet the fact that a condensation product of two benzoyls, one lysine, one glucosamine and one alanine would have the following composition: C 57.80 per cent., N 9.30 per cent., H 6.31 per cent., O 26.57 per cent., while this fraction gave as follows: C 58.68 per cent., N. 8.96 per cent., H 5.88 per cent., O 26.48 per cent., may be regarded as suggestive and might indicate a molecular formula of $C_{29}H_{38}N_4O_{10}$.

On the Composition and Toxic Properties of Ibervillea Sonoræ: Julia A. Emerson and W. H. Welker.

The Comparative Chemical Composition of the Hair of Different Races: P. B. Hawk and T. A. Rutherford.

On the Chemical Composition of the Nasal Mucous Membrane: B. Russell and Wm. J. Gies.

The following percentage data on general composition represent average results of analyses of tissue from many oxen:

Portion.	Water.	Solids.	Organic Matter.	Inorganic Matter.
Anterior.....	76.69	23.31	22.34	0.97
Median.....	78.68	21.34	20.34	1.00
Posterior.....	79.61	20.39	19.38	1.01
Longitudinal sections selected at random.	77.64	22.36	21.49	0.87
Transverse sections selected at random.	77.74	22.26	21 46	0.80

The quantity of ether-soluble material is equal to about 8 per cent. of the solid matter. Reducing substance was absent from the aqueous extracts. Neither proteolytic nor amylolytic enzymes have thus far been detected. Autolytic changes will be investigated.

Much of the proteid in the tissue dissolves in water and salt solutions. Successive extractions of the fresh tissue in water, 5 per cent. sodium chloride and 0.5 per cent. sodium carbonate yielded solutions from which the following quantities of pure proteid (in terms of percentage of fresh tissue) were precipitated: water, 4 per cent.; sodium chloride, 2 per cent.; sodium carbonate, 0.5 per cent. A collagenous residue, amounting to 10.5 per cent. remained.

Conspicuous among the soluble proteids present in the extracts is an acid-precipitable material, equal to about 2 per cent. of the fresh tissue. Its properties have not yet been distinguished in detail. It

appears to be nucleoproteid or a mixture containing nucleoproteid in large proportion. It does not appear to be coagulable. Preliminary tests have failed to show the presence of mucoid in the extracts.

Nearly ten per cent. of the fresh tissue is indigestible in artificial pancreatic juice, and gelatin is readily obtained from this residue. Only about one per cent. of the fresh tissue remains undissolved in artificial gastric juice. This residue contains nuclein.

ORGANIC AND INORGANIC CHEMISTRY.

Wm. L. Dudley, chairman.

Some Hydrocarbons in Louisiana Petroleum: C. E. COATES.

In the investigation of the petroleum from Jennings, Louisiana, the lighter fractions were found to consist of the compounds C_8H_{14}, C_9H_{16}, $C_{10}H_{18}$, $C_{11}H_{20}$, $C_{12}H_{22}$, etc., all of the series C_nH_{2n-2}. The petroleum is of an asphaltic base and the substances $C_{12}H_{22}$, $C_{13}H_{24}$, etc., seem to be identical with those previously obtained from asphaltum and asphaltic oils. These have been assumed to be derivatives of dihexahydrodiphenyl because $C_{12}H_{22}$ was the lowest known member. The occurrence of members still lower would seem to make this theory improbable. The series is, therefore, of a constitution as yet undetermined.

Diphenylamine Compounds of Chloral: A. S. WHEELER. (By title.)

The Chlor-hydrochlorides of Pinene and Firpene: G. B. FRANKFORTER and F. G. FRARY. (By title.)

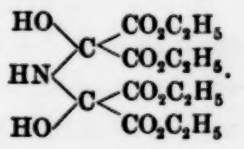
Aluminum Phenolate: A. N. COOK. (By title.)

The Methoxy- and Ethoxydibromphenanthrenes and Some of their Isomers: G. B. FRANKFORTER and C. R. CRESSY. (By title.)

Ethyl Oxomalonate and its Behavior toward Ammonia: R. S. CURTISS.

Ethyl oxomalonate, has always been a costly substance to make in any considerable quantity. It can be readily prepared with a large yield (95 per cent.) by the action of nitrous anhydride on ethyl malonate at a low temperature. The product is purified by vacuum distillation.

Dry ammonia gas reacts strongly with ethyl oxomalonate, or with its hydrated form, ethyl dioxymalonate. Under certain exact conditions it produces a white crystalline substance, dioxyiminodimalonic ester,



This body is very unstable, and dissociates into ammonia and ethyl dioxymalonate if allowed to stand in moist air. The same change occurs rapidly if it is placed in water.

Note on the Action of Hot Cupric Oxide on Sulphuric Ether: J. P. ATKINSON and H. DURAND. (By title.)

We noticed while examining medicinal prescriptions, containing ether, for methyl (wood) alcohol, that we invariably obtained a strong formaldehyde reaction, both by odor, Hehner's test, and the morphine-sulphuric acid test.

Believing that it was impossible that all the prescriptions could be adulterated, we tested samples of pure ether separately, and found that this compound would yield formaldehyde upon oxidation with hot copper oxide. We have since tested many samples of ether of undoubted purity, manufactured by the best known chemical houses, and have always obtained the same result.

The reaction can be written as follows:

$$\begin{matrix} C_2H_5 \\ C_2H_5 \end{matrix} > O + 4CuO = 4HCHO + 4Cu + H_2O.$$

In Watt's 'Dictionary of Chemistry' platinum black is mentioned as a reagent which produces this reaction, but since a hot copper spiral is usually used in the qualitative method of determining the presence of methyl alcohol, we call attention to this reaction.

The Use of Porcelain Dishes in Silicate Analyses: F. L. Kortright.

Platinum dishes are usually preferred for evaporations in silicate analyses, on the assumption that porcelain dishes are liable to be corroded and thus an excess of silica obtained. In a few cases where a loss of silica is assumed to occur through the use of porcelain dishes, the statement is made that the loss occurs through not being able to see the silica adhering to the white surface of the porcelain.

It has now been found that the difficulty in seeing the adhering silica is not the chief cause of loss when porcelain dishes are used, but that a portion of the silica adheres so tightly to the dish that it is not possible to remove it by any ordinary methods. In one case where 17.93 per cent. of silica was obtained by using a platinum dish, only 17.09 per cent. of silica was obtained when a porcelain dish was used. By suitable treatment with ammonia, however, the silica adhering to the porcelain dish was separated, and the total silica, when using a porcelain dish, was then found to be 17.97 per cent. Other determinations of silica in porcelain were reported, and although the variations from the values obtained in platinum were not so striking, the results were all low when ordinary methods were employed for removing the silica from the dish.

An Occurrence of Native Sulphur in Oconee County, Ga.: H. C. White. (By title.)

Report on the Water of Death Gulch, Yellowstone National Park: G. B. Frankforter. (By title.)

The Determination of Silica: N. Knight. (By title.)

On the Occurrence of Helium in Natural Gas: H. P. Cady and D. F. McFarlane. (Read by E. H. S. Bailey.)

PHYSICAL CHEMISTRY.

Louis Kahlenberg, chairman.

The Transition Temperature of Sodium Bromide. A New Fixed Point in the Thermometric Scale: T. W. Richards and R. C. Wells. (Read by the chairman.)

The results of this paper may be summed up in the following sentences:

1. Pure sodic bromide is not to be obtained by recrystallizing the ordinary commercial samples, but must be made from pure bromine and pure sodic carbonate.

2. Prepared in this way, our salt upon analysis was found to correspond very closely with the new atomic weight of sodium, 23.008, if silver be taken as 107.93, and bromine, 79.955, therefore, it was presumably pure.

3. The less pure material on successive recrystallization gave in every case a slightly rising transition temperature as the crystallization proceeded. Only the purest material melted at a perfectly constant point, therefore, constancy of melting point is an indication of purity; but it is safer to analyze the salt as well.

4. When all precautions are taken it is possible to duplicate the results for the transition temperature with samples of salt prepared in different ways and at different times without great difficulty; a value within .01 of the truth may be easily obtained and further precautions make a much greater accuracy possible. Therefore, the point is one suitable to use in the

calibration of thermometers, although its determination requires more chemical skill than that involving sodic sulphate.

5. The actual value of the transition temperature on the international hydrogen scale is 50.674°.

(To be published in the *Proceedings* of the American Academy and the *Journal* of the society.)

A Method of Standardizing Thermometers Below Zero: T. W. RICHARDS and F. G. JACKSON. (Read by the chairman.)

This paper describes a simple method of calibrating thermometers at temperatures below the freezing point of water, by using as a standard of comparison the depressions of the freezing point caused by given additions of hydrochloric acid. Data, based upon a very accurate thermometer standardized at the Bureau International at Sèvres, are given for the construction of a curve enabling direct comparisons of a thermometer to be made with a minimum of labor. The manipulation consists simply in stirring hydrochloric acid into a mixture of pure ice and water until the desired point on the doubtful thermometer is reached. Analysis of the solution then gives, by reference to the curve, the true freezing point; and the difference between this value and that read on the thermometer gives the error of the thermometer. The method is shown to be both practically and theoretically satisfactory. This paper is preliminary in nature, and does not pretend to give final values, because only a single standardized thermometer was used.

(To be published in the *Proceedings* of the American Academy and the *Journal* of the society.)

The Heat of Dilution of Resorcinol in Alcoholic Solutions: S. T. LINCOLN.

The Solubility of Gypsum in Solutions of Ammonium Sulphate: J. M. BELL and W. C. TABER.

The solubility of gypsum in ammonium sulphate solution has been investigated by Droeze, Cohn and Sullivan at temperatures not exceeding 25° C. At 50° C. the authors have found that the compositions of solutions lie on three curves, one representing solutions in equilibrium with gypsum, one representing solutions in equilibrium with ammonium sulphate, and the third representing solutions in equilibrium with a double salt which was found to have the composition $CaSO_4 \cdot (NH_4)_2SO_4 \cdot 2H_2O$.

The Solubility of Gypsum in Solutions of Magnesium Sulphate: F. K. CAMERON and J. M. BELL.

Owing to the difficulties in determining small amounts of calcium in the presence of large amounts of magnesium the authors have adopted the following method for the determination of the solubility of gypsum in solutions of magnesium sulphate. Weighed plates of selenite were placed in known amounts of solutions of magnesium sulphate of concentrations which had been determined previously. The loss in weight of the plates is a measure of the solubility in these solutions. The solubility curve at 25° is rather remarkable, as it has both a minimum point and a maximum point. At low concentrations of magnesium sulphate the solubility of gypsum decreases as the content of magnesium increases, but above 14 grams $MgSO_4$ per liter the solubility of gypsum increases up to a concentration of about 100 grams $MgSO_4$ per liter. From that point the solubility decreases again. The solution in equilibrium with both solid phases contains 355 grams $MgSO_4$ and 0.50 gram $CaSO_4$ per liter.

Two tentative explanations are offered to account for the peculiar shape of the curve. The change of density of the solvent due to the presence of solutes (concerning which change practically nothing

is known) may account for the peculiar curve. The second explanation is that the magnesium ion, the sulph-ion and the undissociated $MgSO_4$, the proportions of which change with the concentration, have altogether different effects upon the solubility of gypsum.

On Monday afternoon the society visited Audubon Park and the sugar experiment station, where opportunity was given to witness all the processes of sugar-making, from the growing cane to finished sugar.

On Tuesday morning a special train was chartered on the Louisiana Southern Railroad to take the party to the Braithwaite Sugar Factory where about one thousand tons of cane are worked up per week. In the afternoon a sugar refinery and the National Rice Mills were visited.

CHAS. L. PARSONS,
Secretary of Section C,
C. E. WATERS,
Press Secretary.

SCIENTIFIC BOOKS.

The Organization and Cell-lineage of the Ascidian Egg. By Professor E. G. CONKLIN, Journal of the Academy of Natural Sciences of Philadelphia, Second Series, Volume XIII., Part I., 1905.

The work on cell-lineage which produced so large a number of papers a few years ago has very naturally led to the study of the visible organization or differentiation of the egg, not only during cleavage, but in earlier stages. The search for cell homologies has given place in large measure to the search for 'formative substances,' 'morphogenic substances' or 'morphoplasmic substances' as the visible differentiations of the egg have been variously called. And since it is true in biology as elsewhere—perhaps more so—that 'they that seek shall find,' our knowledge of the visible differentiations of the egg-substance is rapidly increasing.

The paper under review constitutes an important contribution to this subject. It is an exceedingly careful study, based primarily upon the egg of *Cynthia* (*Styela*) *partita* Stimpson, with comparative observations on the eggs of *Ciona intestinalis* (L.) Flemming and *Molgula manhattensis* Verrill.

The titles of the seven sections, which with the introduction compose the paper, indicate its scope: I., 'The Ovarian Egg'; II., 'Maturation and Fertilization'; III., 'Orientation of Egg and Embryo'; IV., 'Cell-Lineage'; V., 'Later Development'; VI., 'Comparisons with Amphioxus and Amphibia'; VII., 'The Organization of the Egg.'

The most important cytological observations concern the character of the spindles in maturation and the first two cleavages. The maturation spindles are without centrosomes and are formed wholly within the nuclear area: at first their fibers radiate in all directions, but finally form a barrel-shaped spindle. Influence of centrosomes and traction of spindle fibers are not concerned in the separation of the chromosomes in the maturation divisions. In the first cleavages a small nuclear spindle similar to the maturation spindles lies between two large asters.

The spermatozoon enters near the lower pole and rotates after entering. The centrosome is derived from the middle piece and gives rise to the cleavage centrosomes. As regards orientation of the ascidian egg much difference of opinion has existed. Conklin reviews the various systems of orientation, viz., those of Van Beneden and Julin, Seeliger, Samassa and Castle, and gives what appears to be convincing evidence in favor of the first mentioned. According to this the first cleavage plane corresponds with the median plane, the spindle being eccentric toward the posterior pole. The second cleavage is transverse. The intersection of these two planes corresponds with the dorso-ventral axis of the gastrula and the third cleavage separates dorsal from ventral cells.

The account of cell-lineage is complete to a stage consisting of 218 cells. Gastrulation begins at about the 112-cell stage. Development is remarkably rapid, *Cynthia* and *Ciona* attaining the tadpole stage in twelve hours after fertilization and *Molgula* in eight hours.

Extensive cytoplasmic movements during the earlier cleavages are described.

Conklin differs from Castle in maintaining that the nervous and muscular systems do not arise from a common primordium and that there is no nerve ring around the blastopore.

Comparison of the early development of ascidians, *Amphioxus* and amphibians shows agreement, according to Conklin, as regards axial relations of egg and larva, bilaterality of cleavage, method of blastopore-closure, and probably also as regards origin and position of neural plate chorda and mesoderm.

But the paper is primarily concerned with egg organization. Hypotheses of formative substances and organization are receiving much attention at present, but have been subjected to but little analysis and criticism. It has seemed desirable, therefore, although the writer does not over-value destructive criticism, to attempt in connection with this review a brief critical examination of some of the more important conclusions set forth in this paper.

The earliest indication of polarity consists in the location of the yolk matrix on one side of the nucleus and a slight eccentricity of the latter toward the animal pole.

Since the yolk matrix is derived, according to the author, from the sphere of the last oogonic division and supposedly contains the centrosome, he is inclined to identify the polar axis of the egg with the cell axis in general and suggests that polarity may thus be handed down from one generation to another.

In the living eggs of *Cynthia, Ciona* and *Molgula,* when first laid, three regions are distinguishable, a peripheral layer of clear protoplasm in which the test cells lay in earlier stages and which in *Cynthia* contains sparse yellow granules, the central mass of yolk and the large germinal vesicle. When the nuclear membrane disappears at the beginning of maturation a large amount of clear protoplasm passes into the cell-body and forms a mass eccentric toward the animal pole and distinct from the yolk and peripheral layer.

The spermatozoon enters on the lower hemisphere, apparently at any point within 30° of the vegetal pole. After entrance rotation occurs and the aster precedes in later movements.

Immediately after the entrance of the spermatozoon the yellow and clear protoplasm flow rapidly to the lower pole where the yellow protoplasm collects around the point of entrance; the clear protoplasm lies at a deeper level. The yellow protoplasm then spreads out until it covers the surface of the lower hemisphere.

The withdrawal of protoplasm from the upper pole leaves the maturation spindles closely surrounded by yolk. The polar bodies are thus formed at the middle of a yolk-rich hemisphere, which is, however, the animal pole and not the vegetal pole as was claimed by Castle.

Castle's conclusion that the polar bodies are formed at the vegetal pole of the ascidian egg has stood since its appearance in disagreement with our knowledge of most other eggs. Conklin's observation of the movement of the chief protoplasmic portions of the egg toward the vegetal pole is important in that it clears up this error.

The sperm nucleus moves from the point of entrance toward the equator in a path which is apparently predetermined. This path lies in the plane of the first cleavage and the point, just below the equator at which the sperm nucleus stops in its upward movement, becomes the posterior pole of the embryo. All the axes of the future animal are now clearly established, antero-posterior, right-left, dorso-ventral.

Conklin's statements regarding the path of the spermatozoon appear to the writer to be in serious conflict. If the spermatozoon enters at any meridian of the egg and moves from its point of entrance along a path which corresponds with the plane of the first cleavage, as Conklin states, the only possible conclusion would seem to be that the point of entrance determines the plane of the first cleavage. Yet Conklin regards this path as predetermined. The only evidence offered in support of this view is that the spermatozoon apparently does not always take the shortest path to the equatorial region, but sometimes crosses the egg axis on its way. This conclusion in turn is based on the study of sections. If the copulation path of the sperm is predetermined penetration must be followed by movement into the predetermined meridian

in all cases except where the point of entrance happens to lie in this meridian. No evidence for such movement is given; indeed, it is by no means demonstrated that the spermatozoon always moves in a meridian of the egg. The movements of the spermatozoon constitute the only indications that bilateral organization exists before fertilization and they seem to the writer to oppose rather than to support the conclusions drawn from them.

As the sperm nucleus moves to the posterior pole the clear and the yellow protoplasm move with it; the latter collects into a yellow crescent with its middle at the posterior pole and its horns extending about half way around the egg just below the equator. This position it retains throughout the whole development, giving rise to the muscle and mesenchyme cells.

After the sperm and egg nuclei have met at the posterior pole they move in toward the center of the egg and the clear protoplasm goes with them; the only place where the latter remains in contact with the surface is along the upper border of the crescent. At the close of the first cleavage the nuclei and clear protoplasm move into the upper hemisphere, and thereafter, throughout development, this hemisphere contains most of the clear protoplasm and gives rise to the ectoderm.

The yolk which before maturation was central in position is shifted toward the animal pole when the protoplasm flows down to meet the spermatozoon; when the sperm nucleus and surrounding protoplasm move to the posterior pole the yolk is moved down around the anterior side of the egg to the lower pole, and when the clear protoplasm moves into the upper hemisphere of the yolk is largely collected in the lower hemisphere. This yolk-rich area gives rise to the endoderm.

At the end of the first cleavage the chorda and neural plate areas are visibly different from surrounding regions, since they contain less yolk. Later muscle and mesenchyme become distinguishable, the former being deep yellow, the latter light yellow or clear.

These are the most important facts regarding the 'organ-forming substances.'

Before turning to Conklin's general conclusions a brief consideration of the grounds for believing that the differentiated regions represent formative substances is necessary. And first, what are the formative substances? The visible differentiations of the egg are due not to visible differences in the protoplasm itself, but to the localization of the inert substances, yolk and the yellow granules. Conklin does not regard these inert substances as formative, but apparently believes their localization indicates a corresponding localization of different 'kinds of protoplasm.' We are justified in inferring from the presence of different inert substances that different kinds of activity have occurred in the past, but certainly a single 'kind' of so complex a substance as protoplasm is capable of various activities under different conditions. Moreover, the significance of inert substances in protoplasm is primarily retrospective, not prospective.

The protoplasm containing yellow granules in the *Cynthia* egg gives rise to muscle and mesenchyme, according to Conklin. Yet the yellow granules are not confined to this region, but appear about all the nuclei during cleavage, about the nuclei of the test cells, and in the viscera of the adult. In other words, there is no indication that this region contains any specific kind of protoplasm not found elsewhere. During ovarian stages the test cells invade the peripheral layer of the egg. It seems at least not improbable that the yellow granules are associated with the earlier presence of the test cells.

The yolk spherules are similarly inert; their localization in the egg can be as readily explained on physical grounds as by postulating a specific kind of protoplasm in the region where they exist. It is quite probable that the presence of yolk granules determines special activities in the protoplasm about them, and indeed it is not unlikely that the yolk itself is the important entodermal formative substance. But that there is no special formative substance corresponding to the yolk region is indicated by the fact that parts of it go to other than entodermal regions.

The fact that the clear protoplasm from the nucleus and the yellow protoplasm move downward to meet the sperm and accompany it in its movements does not necessarily indicate anything more than greater mobility of these areas in consequence of the absence of yolk. In certain other eggs, where no such areas

exist, the protoplasm from between the yolk spherules gathers about the spermatozoon. There is, moreover, no certainty that the same protoplasm remains continuously in a given region. The regions persist, but in view of the observations on ectosarcal activities in eggs and the extensive flowings of cytoplasm to which Conklin himself has devoted so much attention, it seems very probable that there is extensive physical interchange of protoplasm between various parts of the egg. For example: is there any certainty that the area of clear protoplasm escaping from the nucleus at maturation and later giving rise to ectoderm really consists throughout of the same protoplasm? There is no visible boundary between it and other portions of the cytoplasm. In short, how can we identify the actual formative substances, if such exist, and how can we be certain that they do exist? Caution is certainly necessary along this line; observation alone does not afford a sufficient basis.

The final section of the paper is devoted to a general discussion of the problem of egg organization and its genesis. The first part of the section is largely a résumé of our knowledge and opinions regarding polarity, symmetry and localization and only certain points need be considered.

In the opening sentences of the section the following statement occurs:

> For our present purposes the organization of the germ cells * * * may be held to include phenomena of polarity, symmetry and localization; it obviously includes other things also, such as regeneration and regulation, which are not, however, objects of investigation in this work.

In the discussion of localization the position is taken that experiments with egg fragments are no test of the presence or absence of differentiation and the ascidian egg is cited as a case in point; here the cleavage is determinate, the differentiations of the various parts of the unsegmented egg are very great, yet experiments have apparently demonstrated the totipotence of the first four blastomeres. From consideration of these facts Conklin is led to the following conclusion:

> Just as some adult forms show little capacity for regeneration or regulation while others of equally complex differentiation show this power in high degree, so it seems that the capacity for regulation shown by eggs is more or less independent of their differentiation.

Incidentally it would be interesting to know on what facts the first half of this statement—that regarding adults—is based. To the writer there seems to be no escape from the conclusion that an isolated blastomere capable of producing a whole embryo is in some way more like the whole egg than another without such power. Moreover, it was admitted in the sentence quoted a few lines above that egg organization must include the phenomena of regulation. Even if we follow Conklin and adopt Roux's view of two different methods of development, direct and indirect, the organization must provide for each. There is something very like a dilemma here.

This is an excellent example of the difficulties involved in maintaining the position that the visible cytoplasmic differentiations are formative in character. How far that is the case observation alone can never determine. Conklin says 'all the experiments in the world could not have shown as satisfactorily as direct observation has done the remarkable cytoplasmic differentiations and localizations of this egg'—viz., the ascidian. But it is equally true that all the observation in the world could not have shown as satisfactorily as experiment has done—and we may add, will do—how far these cytoplasmic differentiations and localizations are from representing the actual formative powers of the egg.

As regards the genesis of egg organization, Conklin believes that the differentiations of eggs, blastomeres and possibly other cells also are the result of two processes, the genesis of unlike substances and their localization. The escape of nuclear material into the cell body, and the formation there of specific substances and their localization are regarded as affording a specific mechanism for nuclear control of development 'and as harmonizing the facts of cytoplasmic organization with the nuclear inheritance theory.' As a case in point, the distribution of the sphere material from the last oogonic division is cited. Conklin holds that a part of this material forms the yolk

matrix and a part passes into the peripheral layer. If the sphere material is derived from the nucleus as is the case in Gasteropods, according to Conklin, then both the mesoplasm and entoplasm receive substances derived from the nucleus at the preceding division. Again, the clear protoplasm (ectoplasm, Conklin) escapes from the nucleus at the first maturation division.

The various substances arise epigenetically even in the nucleus, but 'all the evidence favors the view that back of the organization of the cytoplasm is the organization of the chromosomes which is definite, determinate and primary.' Thus from visible formative substances we pass to invisible, hypothetical substances and end not far removed from Weismann in the organization of the chromosome.

The term 'organization' is much employed of late, apparently as an explanation. But organization alone is the dynamo without electricity. The important question regarding all hypothetical organization in biology is, will it work? It would seem that at least some suggestion as to how it may work should be offered. How and why, for example, do the formative substances form what they are assumed to form? How and why does the nucleus give rise to ectodermal substance at one time and to mesodermal substance at another? If we have truly abjured vitalism organization must be reducible to terms of physics and chemistry. Why should we not make the attempt to reduce it instead of clinging to the vague term. If it is not so reducible then organization is a vitalistic concept. To the writer it seems at least a question whether a 'definite, determinate and primary' organization of the chromosomes is reducible to terms of physics and chemistry.

Four types of germinal localization are distinguished by Conklin: the annelid-mollusk, the ctenophore, the echinoderm and the ascidian. Among these there is no convergence in passing from later to earlier stages. Precocious segregation is rejected as an explanation of egg organization. This organization, like adult structure, must in the final analysis depend upon the chromosomes in the germ cells. The structure of later stages is the result, not the cause of the structure of the germ cell. Extensive modifications of adult structure may therefore be brought about by slight changes in germinal organization.

In conclusion, one or two minor matters should, perhaps, be mentioned. The author uses the words 'ovocyte' and 'ovogonic,' but also the word oöplasm. The first two are examples of those mongrel words with which biology has been frequently afflicted; the last is a word of good parentage.

Addition of the plate numbers to the references to figures would certainly facilitate the finding of particular figures.

C. M. Child.

Lehrbuch der Meteorologie. Von Dr. Julius Hann. Second edition. 8vo. Leipzig, 1906. Pp. xi + 642.

What Hann's 'Handbuch der Klimatologie,' in its first and second editions, is to climatology, the same author's 'Lehrbuch der Meteorologie,' in its first and second editions, is to meteorology—a comprehensive, well-digested, thoroughly authoritative text-book; absolutely indispensable to every worker in this science, and to every one else who seeks information on any special point in meteorology and who wishes to go to headquarters for an answer to his question. The first edition of the 'Lehrbuch' appeared in 1901 (see review in Science, Vol. XIV., N. S., December 20, 1901, pp. 966–967), and although but four years have elapsed since then, a second edition is now before us, with all the latest advances of the intervening period set fully and clearly before the reader. What we said in our notice of the first edition can be repeated, with added emphasis, of the second. Everything is brought down to date. For example, in the earlier edition it was stated that the results of the international cloud year were incomplete, but would probably give a fairly conclusive answer to questions regarding cloud heights and velocities. On p. 208 of the new edition it is stated concerning these results that they *have given* an answer to almost all questions as to cloud heights and velocities. This is typical of the treatment

of every subject in which advance has been made within four years. To give one other example, on pages 384–5 of the later edition the evidence concerning the movements of the upper air currents around cyclones which has been obtained by means of *ballons-sondes* is added to what was included in the first issue. The most important additions naturally concern the results obtained in the free air with balloons and kites, and all the important results obtained up to the time of printing the book are discussed, including the newer investigations of Bigelow, Shaw and Hildebrandsson. The recent Antarctic expeditions have contributed towards making this volume thoroughly complete up to date.

The second edition differs from the first in having larger type for the main portion of the text, which improves the book decidedly, and in the omission of a good many of the fine-print passages which rather clogged the first edition so far as easy reading was concerned, although they contained much valuable matter. There have been added a useful table of monthly and annual mean temperatures for about 140 different stations scattered over the world, many of these means having been newly determined by the author; a small table of monthly rainfalls for some of the more important stations; a vapor-pressure table, and a table for the convenient calculation of differences of altitude from barometer readings. The first edition had 805 pages; the second has 642. There is thus a considerable reduction, brought about by the omissions just referred to, but in spite of this shortening, the new book is extraordinarily complete, and for all ordinary purposes will serve as the authority beyond which there is no need of going. For detailed investigations of special points, however, it will be necessary to refer to the fuller bibliographical notes of the earlier edition. For the working meteorologist both books are needed. The climatologist also, in spite of the extraordinary richness of the material in the same author's 'Handbuch der Klimatologie,' will find many of the data and discussions in the 'Lehrbuch' invaluable as supplementary to the 'Handbuch.'

Meteorologists may well congratulate themselves on having the 'Lehrbuch' in its new form. Their fellow workers in other sciences may well envy them. For it does not happen to every scientist that the master mind in his subject produces a volume so wholly beyond the possibility of unfavorable criticism; so indispensable; so sure to last for years as the undisputed authority.

R. DEC. W.

SOCIETIES AND ACADEMIES.

THE TORREY BOTANICAL CLUB.

THE meeting of November 14, 1905, was called to order by President Rusby in the American Museum of Natural History. Twenty persons were in attendance.

Dr. C. Stuart Gager was elected recording secretary to succeed Mr. Edward W. Berry, resigned.

The first number on the scientific program was a paper by Dr. D. T. MacDougal on 'Bud Sports.'

The speaker gave an outline of the subject of bud sports and described some illustrative cases. Three striking examples from the cultures of the evening primroses in the New York Botanical Garden in 1905 were discussed. In one, a hybrid gave a flowering branch which sported into the characters of a sister hybrid; in the second, a fixed hybrid produced a branch constituting a reversion to one of the parents, a third, a mutant of the common evening primrose, produced a branch which resembled the parental form. Attention was called to the fact that all mutations are essentially vegetative and, therefore, a greater terminology would necessitate the use of the terms 'bud sport' or 'bud mutant,' or 'seed sport' or 'seed mutant.' While seed mutants may theoretically be traced to one cell, it seems difficult to do this in the case of bud sports. The action of the growing point in the protection of buds was illustrated with diagrams, and an enlarged photograph of one of the bud sports was exhibited.

Dr. Tracy Hazen exhibited a hybrid between *Asplenium murrare* and *A. trichomenes* from Vermont.

The meeting of January 31, 1906, was held at the New York Botanical Garden. President Rusby presided, and twenty-seven persons were present.

Dr. Britton exhibited the photographic reproduction of the 'Dioscurides Codex Aniciæ Julianæ picturis illustratus, nunc Vindobonensis Med. gr. I phototypice editus,' recently acquired by the Library of the New York Botanical Garden.

This work is of the utmost importance in the study of the history of botany, on account of the large number of pictures of plants which were for the most part based on originals presumably of the fifth century, and are now here reproduced in facsimile for the first time. The original manuscript is one of the treasures of the Imperial Library of Vienna. It is said to date from 512 A.D., and was written and the miniatures painted for the Princess Anicia Juliana, of Byzantium, and is the basis of all the early herbals. The work is Vol. 10 of the 'Codices Græci et Latini Photographici Depicti,' a series of reproductions of valuable manuscripts issued under the editorial supervision of Dr. de Vries, the librarian of the University of Leyden. It consists of two folio volumes bound in heavy oak boards and is a faithful facsimile of the celebrated original, reproducing it down to the smallest fragment. The plates are of great beauty and remarkable for a certain vigorous distinction and decorative character that illustrators of the present day would do well to study. Not the least interesting are the miniatures showing groups of physicians and botanists in conclave, painters at work on plant pictures, the portrait of the lady Juliana, herself, and lastly a most beautiful ornamental title page. Historical, prefatory and descriptive matter are by Anton von Premerstein, Carl Wessely, and Joseph Mantauni.

Previous to the present reproduction, plates of this manuscript were prepared under the supervision of Jacquin, two impressions of which are known to be in existence, the one having been in the possession of Linnæus is now in the library of the Linnæan Society of London; the other was sent to Sibthorpe to be used in the compiling of his 'Flora Græca.' This last copy is now preserved at Oxford.

The first paper on the program as announced was by Professor L. M. Underwood, on 'Six New Fern Genera in the United States.' Professor Underwood gave a brief account of the additions to the fern flora of the United States since the year 1900. Six genera and over forty species are included in the list which also includes several species new to science. The list will appear in the *Bulletin* for March. The genera new to the country, and some of the more interesting species were exhibited. The paper was discussed by President Rusby and Dr. Murrill.

The second paper was by Mr. H. A. Gleason, entitled, 'Notes on the Flora of Southern Illinois.' The southern portion of Illinois is crossed by an eastern prolongation of the Ozark Mountains, which have a marked influence on the rainfall. The flora is characterized by the presence of about four hundred species of distinctively southern plants, constituting three separate floras, each of which has entered the state from a different direction. Of these, the most sharply defined is the coastal plain flora which has entered the region by migrating up the Mississippi River from the south. The extensive cypress swamps are largely composed of coastal species. An Alleghenian element has crossed the highland region of Kentucky and southern Indiana, and is well represented in Illinois in the area of heavy rainfall along the Ozark hills. The third is a southwestern flora, characterized mainly by xerophilous species. They have migrated along the Ozark uplift through Missouri, but in Illinois they have for the most part left the hills for the arid region just to the north. The three migration routes all follow ecological isotones and the three floras are never associated.

The last paper was by Mr. R. S. Williams, on 'Plant Collecting in the Philippines.' The speaker gave an account of his recent botanical journey to the islands, describing briefly the country and its inhabitants, and some of his experiences in collecting.

Professor Underwood was asked to act as

delegate to the council of the Scientific Alliance for 1906.

C. STUART GAGER,
Secretary.

THE AMERICAN CHEMICAL SOCIETY. NEW YORK SECTION.

THE fourth regular meeting of the season was held at the Chemists' Club on Friday, January 5, at 8:15 P.M. The vice-chairman, Dr. A. A. Breneman, presided. The following papers were presented.

Is the Optical Rotatory Power an Additive Property of Asymmetric Carbon Atoms? M. A. ROSANOFF.

In the memoir founding the science of stereo-chemistry in 1875, van't Hoff made the well-known assumption that when two or more asymmetric carbon atoms are associated in a molecule, the rotation due to each is independent of the rotations due to the others. The assumption was made the subject of extensive experimental inquiry, carried on between 1893 and 1896, on the one hand by Guye (of Geneva) and his pupils, on the other hand by Walden (of Riga). The results seemed to establish the correctness of the assumption beyond possibility of doubt, and the verified assumption was incorporated in stereochemistry as 'The Principal of Optical Superposition.' The author now demonstrates that Guye's and Walden's experimental method was theoretically faulty, so that the results fail to serve the object of the experiments. Having thus reopened the question as to the correctness of van't Hoff's assumption, he considers it in the light of facts that do have a bearing on it, and comes to the conclusion that van't Hoff's principle is wrong and should be replaced by a new principle, provisionally formulated as follows: The rotatory power of an asymmetric carbon atom depends upon the composition, constitution and configuration of each of its four groups.

On 5-Amino-4-ketodihydroquinazoline and 5-Amino-2-methyl-4-ketodihydroquinazoline: VICTOR JOHN CHAMBERS and MARSTON TAYLOR BOGERT.

The authors prepared the above quinazolines by reducing the corresponding nitro compounds. Of the 5-amino-4-ketodihydroquinazoline, its hydrochloride, chlorplatinate; bibrom, acetyl, benzoyl and phenyluramino derivatives were investigated; as well as its reactions with nitrous acid, chloroform and potassium hydroxide, and with benzaldehyde. Of the 5-amino-2-methyl-4-ketodihydroquinazoline, beside the free base, only the hydrochloride and chloraplatinate were prepared.

On Phosphotungstates of Amino Acids: P. A. LEVENE.

In the course of a study of the products of tryptic digestion of gelatine the author made the observation that glycocol formed a crystalline precipitate on treatment with phosphotungstic acid. This observation led to an investigation into the conditions required for the formation of this phosphotungstate as well as for the formation of insoluble phosphotungstates of other acids.

It was noted that insoluble phosphotungstate could be formed with glycocol, alanin, leucine, glutanic and aspartic acids. Further it was observed that the physical properties, and the solubilities of the phosphotungstates differ to such an extent as to make possible a separation of the individual acids by means of their phosphotungstates.

Dr. Beatty and the author at present are engaged in an effort to apply the method to the study of the products of hydrolysis of proteids. While this work was in progress there appeared a publication by Skraup in which mention is made of the property of glycocol of analin to form crystalline phosphotungstates.

THE section held its fifth regular meeting of the season at the Chemists' Club, on Friday evening, February 9.

The president of the American Chemical Society, Dr. W. F. Hillebrand, presented to Professor Marston Taylor Bogert, of Columbia University, the Nichols medal, which was awarded to him for his researches on the quinazolines.

The regular program of the evening was then taken up and the following papers read:

The Osazone Test for Glucose and Fructose, as influenced by Dilution, and by the Presence of other Sugars: H. C. SHERMAN and R. H. WILLIAMS.

In pure glucose solutions tested at constant volume with fixed amounts of phenylhydrazine hydrochloride and sodium acetate, the time required for the precipitation of osazone varies with the amount of glucose present and is nearly constant for any given dilution. Pure solutions of fructose show similar variations with concentration, but always yield a precipitate of osazone in about one third the time required by the same amount of glucose. Invert-sugar reacts almost as readily as fructose. Maltose retards precipitation of glucosazone, interfering much more seriously with glucose than with fructose. Lactose interferes in a similar manner and to a greater degree than maltose.

Some Derivatives of Citronellal: F. D. Dodge.

The paper is a continuation of the author's previous work on citronellal (*American Chemical Journal,* XI., XII.). The preparation and properties of the so-called citronellal-phosphonic acid and a number of its salts are described.

The decomposition of the sodium salt by heat yielded a secondary alcohol, apparently identical with the iso-pulegol of Tiemann. This reaction, together with the general properties of the acid indicates that it is really a derivative of iso-pulegol, and should properly be called iso-pulegol-phosphonic, analogous to the phosphonic acids of the aromatic series.

The formation of this acid may be utilized for the identification of citronellal, when the latter is present in large amount, and even small quantities of the acid can be detected by means of the characteristic silver salt. The author was unable, however, to confirm the alleged occurrence of citronellal in oil of lemon by means of this reaction.

F. H. Pough,
Secretary.

THE SOCIETY OF GEOHYDROLOGISTS, WASHINGTON.

A special meeting of the society was held on January 29 for the purpose of discussing the significance of the term 'artesian' and of adopting definitions covering its use. As a result of the discussion the following definitions were provisionally adopted, subject to such changes in wording as may be necessary:

DEFINITIONS OF 'ARTESIAN.'

Artesian Principle.—The artesian principle, which may be considered as identical with what is often known as the hydrostatic principle, is defined as the principle in virtue of which water confined in the materials of the earth's crust tends to rise to the level of the water surface at the highest point from which pressure is transmitted. Gas as an agent in causing the water to rise is expressly excluded from the definition.

Artesian Pressure.—Artesian pressure is defined as the pressure exhibited by water confined in the earth's crust at a level lower than its static head.

Artesian Water.—Artesian water is defined as that portion of the underground water which is under artesian pressure and will rise if encountered by a well or other passage affording an outlet.

Artesian System.—An artesian system is any combination of geologic structures, such as basins, joints, faults, etc., in which waters are confined under artesian pressure.

Artesian Basin.—An artesian basin is defined as a basin of porous bedded rock in which, as a result of the synclinal structure, the water is confined under artesian pressure.

Artesian Slope.—An artesian slope is defined as a monoclinal slope of bedded rocks in which water is confined beneath relatively impervious covers owing to the obstruction to its downward passage by the pinching out of the porous beds, by their change from a pervious to an impervious character, by internal friction, or by dikes or other obstructions.

Artesian Area.—An artesian area is an area underlain by water under artesian pressure.

Artesian Well.—An artesian well is any well in which the water rises under artesian pressure when encountered.

M. L. Fuller,
Secretary.

DISCUSSION AND CORRESPONDENCE.

THE KELEP EXCUSED.

If Dr. Cook will revert to my paper published in Science, Vol. XX., 1904, pp. 766–768, he will notice that I did not promise to keep silence till the Greek Kalends, but merely expressed my willingness to wait till that date for the extermination of the cotton boll-weevil by the keleps he had introduced from Guatemala. And I am still waiting. I did, indeed, promise to let the insect rest, as I supposed

that Dr. Cook would confine himself to its economic aspect, a subject on which I had nothing further to say. But he has seen fit to make his observations on the kelep the basis for certain general statements which, if true, would go far towards revolutionizing our knowledge of the social insects. Under the circumstances I craved the privilege of the 'positively last appearance' accorded to some of the members of other professions than my own. Nor have I had occasion to regret this, for may there not be a distinct gain to science in Dr. Cook's admission of some of his errors and his promise to be more careful in the future? In his latest article there are still a few matters which do not seem to me to be fairly stated, and if I again ask for a little space in SCIENCE, it is not for the purpose of continuing my 'scolding' and, perhaps, too drastic criticism, but merely for the sake of setting my previous remarks in a proper light. Dr. Cook says:

> If one were to generalize on this series of entomological episodes the deduction would be that adequate ignorance of literature is a necessary qualification for learning the habits of a new insect like the kelep, for at each important step the investigation has been met by Professor Wheeler's *non possumus*. Last year he was quite as unable to believe that the keleps would kill boll-weevils as he is to credit now their failure to regurgitate nectar. After surviving so many of these literary dangers it is only natural that one become a little reckless, and venture even to hope that in the course of another year the additional facts, at present so objectionable, will receive due credence, having now become a part of 'literature of the subject.'

There can be little doubt that scientific investigation is often impeded rather than furthered by too much attention to the 'literature of the subject.' Many a piece of zoological research may be perverted from the outset by an incessant appeal to what has been written, for reliance on a knowledge of the literature, especially in entomology, may not only clog the free movements of the investigator, but may lead him to waste much valuable time in the blind bypaths of his science. Investigation and publication are, however, two very different matters. One may investigate a thousand things, experience all the thrills of first discovery in every one of them and still never care to inflict one's results on one's fellow beings. But whenever one does decide to publish, it is necessary to reckon with the great 'paper memory of mankind,' the conserved experience of other workers who have loved and investigated the same things. It then becomes a duty to study the 'literature of the subject,' if only for the purpose of bringing the new work into intelligible, organic relation with the old. Failure to do this may be justly interpreted as carelessness, sloth, ignorance or conceit.

After making his observations with commendable enthusiasm and in great freedom of spirit, Dr. Cook failed in his full duty to other investigators—*hinc illæ lacrymæ*. That even now he does not seem to be fully aware of his omissions is obvious from the following considerations:

1. His grounds for concluding that no nuptial flight occurs in the kelep have little value, because it is known that some species of ants, like certain species of *Camponotus* and *Prenolepis*, which celebrate this flight at regular intervals, nevertheless retain males and winged females in their nests during the whole or several months of the year. Moreover, copulation within the nest has been observed in species like our common tent-building ant (*Cremastogaster lineolata*), which has a typical nuptial flight. Miss Fielde has even photographed a number of mating males and females of this species in one of her glass formicaries. Hence there is nothing in Mr. McLachlan's observations on artificial nests of the kelep to demonstrate the absence of a nuptial flight. Like all similar negatives, this would, in fact, be extremely difficult to prove.

2. Dr. Cook's remarks on *Leptogenys* are incomprehensible to me. The queens of *L. elongata* are, indeed, little more than egg-laying workers, as he would have noticed had he read my account of these insects. No one has ever been able to find a winged queen of any of the numerous species of this tropicopolitan genus or of its subgenus *Lobopelta*, although egg-laying workers, similar to those which I found functioning as queens in *L.*

elongata of Texas, have been seen in an Indian species.

3. It is not I, but Dr. Cook, who has been studying the habits of the kelep. I have been trying to interpret his observations in the light of what I have seen in other ants. He claims that I 'was quite unable to believe that the kelep would kill boll-weevils.' Reference to my previous papers will show that this is an unfair and purely gratuitous statement. I have never doubted his observations on this point, but merely the ability of the ants to keep at the good work of killing the pests with sufficient concentration and perseverance to make them a considerable factor in the extermination of the boll-weevil.

4. Dr. Cook endeavors to show that I am wrong in inferring that the keleps can ingurgitate and regurgitate liquid food. He says that they "persist in going about with large, round drops of nectar on their bills. They regularly carry it into their nests in this way, and feed it to their friends and families without having once swallowed it, or spewed it up again. This incredible conduct is very easy of observation," etc. If this observation were beyond suspicion, I should be the last to reject it as a proof of Dr. Cook's contention, for the very reason that it agrees so well with the many primitive habits I have detected in the Ponerinæ that have come under my own observation. But I still have serious doubts on this subject, not because Dr. Cook's statement conflicts with anything in the 'literature of the subject'—on the contrary, it confirms my own statements on *Cerapachys*—but because I have seen large camponotine ants carrying drops of liquid on their mouth parts when they had ingurgitated as much food as they could hold in their crops. Is Dr. Cook sure that none of the liquid is drawn into the crop of the kelep and that this is not regurgitated to members of the family after the hanging drop has been disposed of? Remarkably concise observations would be required to make sure of this point, and as soon as Dr. Cook can produce these I shall be only too glad to accept them.

5. Dr. Cook's remarks on the phylogeny and classifications of the ponerine ants are thrown off in a haphazard, hit-or-miss fashion not at all reassuring to those who can appreciate the long and serious study devoted to these subjects by men like Gustav Mayr, Roger, Forel, Emery, Ernest André and others. Tracing phylogenies is at best a very dubious and highly speculative performance, but it may be said that the phylogenies in question have not only been traced, contrary to Dr. Cook's assertion, but they have been so conscientiously traced that there is practical unanimity on the subject among myrmecologists. The ants of the higher subfamilies (Myrmicinæ, Dolichoderinæ and Camponotinæ) have been derived from the Ponerinæ, and it has long been known that this primitve subfamily embraces more disparate groups of genera than are to be found in any of the subfamilies of recent development. This is, of course, quite in harmony with what is known of many other archaic groups of animals and plants.

William Morton Wheeler.

SPECIAL ARTICLES.

RAMBUR AND THE NATURE OF SPECIES.

In a volume entitled 'Histoire Naturelle des Insectes,' published in 1842, by Dr. M. P. Rambur, prior to Darwin, Wallace and Wagner, there are certain very sage reflections on the nature of genera and species. My attention has been called to this work by Mr. Fordyce Grinnell. I append an extract which is worth reading even at the present day. I place the sentences referring to the effect of varied environment on species-forming in italics.

Dr. Rambur says:

Il ne faut pas se faire illusion, la classification n'est pas la science, n'est pas l'histoire naturelle, elle n'est qu'un moyen factice pour arriver à la connaissance des différents êtres qui se trouvent dans la nature. Certes c'est un progrès heureux de l'avoir basée sur des rapports plus ou moins naturels (quoique quelquefois insuffisants); mais la science est surtout la connaissance de l'être qu'on appelle espèce, l'histoire naturelle est cette connaissance, et celle des rapports nombreux d'organisation et de moeurs que les espèces présentent entre elles. Il ne faut donc pas reculer devant le mot *espèce*, il faut chercher à le comprendre; toute la science est là; c'est s'en écarter

que de dire comme certains naturalistes qu'on ne doit faire des espèces qu'à *son corps défendant*, et de se lamenter sur le nombre de celles qui se trouvent dans les catalogues. Je suis convaincu qu'on n'a pas reconnu toutes celles qui existent dans les collections, ou que beaucoup sont encore confondues sous le même nom. Si nous ne pouvons reconnaitre les modifications presque infinies de la nature, nous ne devons nous en prendre qu'à la faiblesse de notre intelligence; mais vouloir les borner et les restreindre, c'est une petitesse d'esprit, c'est s'éloigner de toute étude philosophique, c'est vouloir abaisser la nature à son niveau, mais non chercher à la comprendre. Il y a bien plus d'inconvénients de confondre une espèce, que de présenter une variété, comme une espèce; en effet, dans le premier cas il se trouve offrant de très-grands rapports d'organisation et de mœurs avec les espèces voisines, présente aussi quelques différences, qui lui sont propres, et qui constituent sa spécialité; c'est un très minime anneau de la grande chaine, qui necessairement unit, ou se lie d'une manière intime avec ceux qui lui sont proches; c'est un passage, une nuance de rapports qui nous échappe; c'est un fait de moins dans la science. Dans le second cas, c'est un être étudié sous plus de rapports; c'est un fait de plus dans la science. Ici la science s'est enrichie, là il y a ignorance; et, qu'importe qu'on ait donné un nom à cette variété, puisqu'elle mérite être notée, l'étude des variétés n'est-elle pas le complément nécessaire de l'histoire de l'espèce; mais l'erreur reconnue, il n'y a qu'un nom de trop, le fait reste. On me dira ce que un être omis, méconnu, qui cependant, tout en vous appelez espèce, nous l'appelons variété, et nous l'avons noté; mais il est évident que si cet être eût été suffisamment étudié dans tous ses caractères, on en aurait fait une espèce. Je ne chercherai pas à définir l'espèce, on a dit que c'était un être qui dans ses générations successives présentait toujours les mêmes caractères d'organisation, *et il faut ajouter dans les mêmes localités et les mêmes circonstances extérieures; car il y a des variétés qui dans certaines localités et circonstances, présentent des différences constantes, et qui pourtant ne paraissent pas des espèces*, ce sont des modifications locales que la sagacité de l'observateur doit reconnaitre; mais quelquefois la chose est difficile: c'est dans ce cas surtout qu'il vaut beaucoup mieux les présenter comme des espèces,[1] car en agissant ainsi on sera porté davantage à les étudier sous tous leurs rapports. *Les espèces sont certainement dues à une différence des localités ou des circonstances extérieures.* Ainsi les espèces enfouies dans la terre et qui ont été détruites par les cataclysmes, sont toujours différentes des nôtres, et les espèces sont généralement différentes aussi, selon les divers points de la terre; mais il est impossible de comprendre pourquoi, et à quelle époque la nature a mis pour ces êtres un terme dans leur modification et les a constitués espèces; et quoique bien certainement il ne paraisse plus s'en former, il *est cependant certains insectes qui semblent à peine limités dans leur modification.*

DAVID STARR JORDAN.
STANFORD UNIVERSITY.

[1] Certaines localités peuvent quelquefois influer d'une manière remarquable sur les espèces; ainsi, dans les îles de Corse et de Sardaigne, qui ne sont que la même chaine interrompue, des insects du continent qui se présentent toujours sous leur véritable type dans la plus grande partie de l'Europe, ont éprouvé dans ces îles, dont certains points ne sont pas à cinquante lieues en mer, une modification telle, que l'observateur se demande avec doute si ce ne sont pas des espèces réelles; ainsi notre *Vanessa urticæ* est devenue *V. ichnusa;* mais aussi la larve se nourrit d'une nouvelle espèce d'*Urtica*. Les *Satyrus megera, semele*, se sont modifiés en *Sat. tigelius, aristeus*. Chez les uns la modification est plus prononcée que chez d'autres.

GLACIAL NOTES FROM THE CANADIAN ROCKIES AND SELKIRKS.

INVESTIGATIONS upon the largest of the accessible glaciers along the line of the Canadian Pacific Railway were begun by the writer in 1902, carried forward during the season of 1904 under the auspices of the Smithsonian Institution and continued during the season just closing. The precipitation from the coast to the Rockies during the winter of 1904–5 was exceptionally light. At Victoria for the months September to April, inclusive, the total precipitation reported was but 21.18 inches, or only 57.1 per cent. of the normal for this region. At Banff, east of the Continental Divide, the total amount for these months was 5.83 inches, or but 53.3 per cent. of the normal. The official records for Glacier, in the Selkirks, are incomplete, but the snowfall for the winter is reported as fifteen feet, which is but one quarter to one third of the usual amount. Following this exceptionally mild winter the summer has been bright

and warm and much melting over and about the glaciers has occurred. Snow has been removed from portions ordinarily covered throughout the year, exposing numerous crevasses and concentrating relatively large quantities of foreign material upon the surface of the ice. The dirt zones, dirt bands, stratification and all the phenomena based upon the differential melting of the ice have stood forth with unusual clearness, so that the season has been an exceptionally favorable one for glacial study. A reexamination was made of the five glaciers upon which a preliminary report was published in May, 1905.[1]

I. *Victoria Glacier.*—Located at the head of the Lake Louise Valley, this glacier is nourished by the snow which falls between Mount Lefroy and Mount Huber, the snow and ice which are avalanched from these mountains and Victoria and that supplied by the double tributary. The avalanches during the spring and summer have been exceptionally numerous and heavy from the hanging glaciers, partially making up for the loss occasioned by the unusual warmth of the summer and the diminished precipitation of the past winter. Along the oblique front the retreat has been much greater for the year than for any other since observations began in 1898. From September 13, 1904, to September 2, 1905, this amounted to 20.35 feet, the average retreat for the last six years being, at this point, 14.5 feet. Some 300 feet farther down the valley the retreat between the above dates amounted to 13.2 feet.

The real nose of the Victoria glacier is completely veneered with rock debris, so that the ice is not visible and is effectually protected from melting. The last episode here was one of advance, the glacier having invaded the forest and mounted an ancient moraine. From July 9 to September 13, 1904, a small stream of clear, ice-cold water was observed to flow from this part of the glacier and stones embedded in the front had settled back an inch. During the year this very small amount of recession has been made up, the points selected upon the boulders lacking but .03 to .06 of a foot of regaining the position occupied when the stations were established, and the nose has been practically stationary.

July 9, 1904, a line of 18 steel plates was set across the Victoria glacier, approximately 100 feet apart and 3,600 feet back from the nose. Although the glacier is here straight, the maximum movement was found to be two thirds of the way across, at plate No. 13, and averaged for 20 days (July 9 to July 29) 2.74 inches daily. In remeasuring the distances moved by the series of plates (July 29, 1904, to September 5, 1905) it was found that plate No. 11 had made the greatest advance, 71.8 feet, giving a daily average of 2.14 inches, or 80 per cent. of its midsummer motion. Forbes's dirt-bands were located in 1904 from the surface of the glacier itself and their distances approximately determined. This season it was found that their upper margins were sharply defined, when seen from a distance of two thirds of a mile, or more, and with the help of an assistant these margins were marked by means of small cairns and their distances afterward measured with a steel tape. From the base of the ice slope upon which they are formed some 19 bands were thus located, their distances apart, expressed in feet, running as follows: 159, 174, 126, 124, 113, 109, 100, 83, 75, 100, 86, 88, 57, 81, 66, 83, 83 and 45. These bands, which are transverse to the glacier at the time of their formation and but slightly curved, become more and more convex down stream and indicate by their shape the locus of maximum surface motion, and there is reason for thinking the approximate annual motion of the ice.

II. *Wenkchemna Glacier.*—As reported previously, this is a piedmont type of glacier, near the head of the Valley of Ten Peaks, made up of some twelve component streams, placed side by side. It lies close in upon the northern side of the great Wenkchemna series of peaks, which form here the Continental Divide. These peaks supply the snow, protect the meager névé field from the noonday sun and contribute quantities of rock debris with which the glacier is almost completely covered. In August, 1904, a series of eight stations was

[1] *Smithsonian Miscellaneous Collections*, Quarterly Issue, Vol. 47, Pt. 4, pp. 453–496.

established along the front and accurate measurements made between definite points upon boulders firmly planted in the front of the glacier and others in the moraine and temporarily stationary. During a period extending over 34 days in 1904 (August 9 to September 12) it was found that the extremities of some of the component streams were stationary, some slowly wasting and others advancing. From September 12, 1904, to September 8, 1905, all the blocks carried at the front of the glacier indicated an advance, the horizontal component of which varied from .15 foot to 1.7 foot. The least movement occurred about the ends of those streams which make up the eastern half of the glacier, while the greatest was about half-way up the long front, opposite Mount Deltaform, where the rolling stones from the glacier are now cutting trees. All the evidence points to the fact that we have here an exceptionally sluggish glacier, which owes its existence to the peculiar conditions under which it has been formed and is now maintained.

At the head of Paradise Valley, the next valley to the west, the Horseshoe glacier is also of the piedmont type, with some fifteen or sixteen component streams. The supply of snow is meager and derived from Mounts Hungabee, Ringrose and Lefroy. The glacier carries much less surface debris than the Wenkchemna and is in slow retreat, the western end having already separated from the main body. In front of each portion there lies a collection of coarse, weathered fragments of the mountains, which are to be correlated with the 'block moraines' of the neighboring glaciers.

III. *Wapta Glacier.*—This imposing ice stream occupies the head of the picturesque Yoho Valley, to the west of the Continental Divide, and is nourished from the great Waputehk snow-ice field. From its great 300-foot archway issues the north branch of the Kicking Horse River. The nose of the glacier lies to the east of this stream and rests upon bed-rock, over which it has been slowly retreating. During the past year (August 18, 1904, to August 31, 1905) this retreat has amounted to 9 feet, as compared with 23 feet of the previous year. The average annual retreat for the past four years is 30 feet. From certain data discovered last season it was calculated that the glacier is shrinking laterally down the eastern mountain slope at the rate of five to six feet a year. Upon the west side of the river the ice front at one point has receded 4.6 feet during the past year.

IV. *Illecillewaet Glacier.*—Passing westward to the Selkirks, we have two glaciers occupying adjoining valleys, the larger of which has more visitors each year than any other glacier upon the western continent. Owing to its size and easy accessibility it has been longer under observation than any other of the Canadian glaciers. Since 1887 it has been in continuous retreat at a mean annual rate of 33.6 feet. For the last seven years this rate has been 25.6 feet. The retreat for the year 1903–4 was 11 feet and for 1904–5 (September 1 to August 25) was but 2.1 feet. This diminution in the recession of the ice front suggests that the glacier is preparing to inaugurate an advance, which would probably have been begun this season had the summer been less warm. Such a result was to have been anticipated from observations made in 1899 by George and William Vaux. Upon comparing their photographs of the glacier, taken from the same view point in 1898 and 1899, it was noted that the ice was increasing in volume in the upper part of the glacier. Along the western side of the glacier, near the nose, a wall of ice about 60 feet high has withdrawn 2.4 feet from the bed-rock, in two years. Around upon the eastern side, at two stations, there has been a retreat of 14 and 16 feet, respectively, during the past year, while higher up the ice has practically held its own for two years.

V. *Asulkan Glacier.*—Owing to its covering of fine gravel and glacial sand the nose of this glacier has behaved exceptionally during the past six years. In August, 1899, the Vaux brothers established a line of reference, marking the position of the nose. During the year following the nose withdrew up the valley a distance of 24 feet. On September 17, 1903, the writer found that the nose had pushed its

way 13.5 feet beyond this line, was ploughing into ground moraine and overturning boulders. August 27, 1904, the nose stood 12.5 feet beyond the Vaux line, indicating but little change. August 27, 1905, it was found to have retreated 34 feet from its position of last year, with its nose embedded in debris, standing 21.5 feet back from the reference line of 1899. This nose now consists of a thin slab of ice, sloping to the west and veneered with fine debris, so that a small amount of melting will lead to a further recession of 30 to 35 feet. The ice in the left lateral moraine is seen to extend four feet beyond the reference line, 25.5 feet beyond the nose, and probably extends several feet farther. Thus while its neighbor, the Illecillewaet, seems preparing for an advance, the Asulkan has made an unusually, for it, great retreat and seems ready, the coming year, to repeat the performance.

W. H. Sherzer.

Michigan State Normal College.

BOTANICAL NOTES.

THE MISSOURI BOTANICAL GARDEN.

The administrative report for 1905, of which advance galleys have been received at the office of Science, is an unusually long and full one. The officers of the board of trustees preface their annual financial statement by an abstract history of the institution for the sixteen years during which it has been under their charge.

Attention is called to the fact that while the gross revenue from the Shaw estate has increased 32.5 per cent. general taxes have increased 62 per cent., while heavy special street and sewer taxes have compelled close economy in the administration of their trust and ultimately absorbed a large fund saved out of the revenue to meet these or other emergency calls. By the conversion of unproductive property bequeathed for the support of the garden into income-yielding property, however, they are hoping to largely increase their revenue; and the belief is expressed that the full realization of the purposes of the founder of the garden and the plans of its director is only a question of time —the foundation being ample and safe.

The value of the original garden, with permanent improvements, is said to have nearly doubled, and details are given of the larger items of improvement. Its area has also been increased nearly one half. Plant houses and frames have been more than doubled in capacity, and the collection of living plants has grown from not over 3,000 to about 16,000 species. The library has been enlarged from about 5,000 to over 50,000 books and pamphlets, and is valued at $84,248. The herbarium, from about 60,000 unmounted specimens, has increased to 524,000 mounted sheets, valued at $79,216.

From a gentleman's country estate, the institution has thus been brought into a well-grounded scientific establishment which now has exchange relations with 859 institutions interested wholly or in part in gardening, horticulture or forestry. The average annual expenditure on its maintenance is said to be $43,675.33, of which the larger items are $23,271.39 for gardening, $5,217.67 for office expenses, $4,418.82 for the library, $2,531.91 for the herbarium, $930.34 for the instruction of garden pupils and $1,000.83 for research purposes. An average of 83,500 persons visit the garden yearly.

Training in gardening has been given to 39 persons, of whom 15 completed the four years' course; and twenty of the number are stated to be now responsibly and successfully employed. In addition to participating in undergraduate botanical work in Washington University, with which the garden is closely allied, though it is independently managed, graduate opportunities have been offered which have enabled five persons to win the master's and six the doctor's degree, with major work in botany. Through the entire period, the policy of administration has been to afford the freest use of the garden facilities for investigation, and to provide for the research use of a part of the time of capable employees, and the Annual Reports of the garden are well known for their original contributions to botanical knowledge.

It may not be generally known that the

following courses in botany are given in the Shaw School of Botany: (1) 'Elementary Morphology and Organography,' (2) 'Cytological Technique,' (3) 'Plant Physiology, including Ecology,' (4) 'Systematic Botany,' (5) 'Plant Pathology and Applied Mycology.' When one takes into the account the growing plants in the garden, the great collection of dried specimens in the herbarium, and the large library, it is evident that here are admirable opportunities for study by those wishing to obtain a thorough knowledge of botany.

The report of the director shows that the customary growth has occurred in the year just closed: 1,769 species of living plants were added to the collections; 34,535 specimens were incorporated in the herbarium, and 5,382 books or pamphlets and 97,676 index cards were added to the library. The number of visitors reached 100,830—of whom nearly one fourth were drawn by a successful exhibition of 211 choice varieties of chrysanthemums, in November; and the director reports an increasing loan-use of the herbarium and library by investigators who are unable to go to St. Louis for study.

LABORATORY OUTLINES FOR GENERAL BOTANY.

UNDER this title, Professor Schaffner, of the Ohio State University, has prepared what must prove to be a very useful laboratory guide in general botany for college students. It is a pamphlet of nearly a hundred pages, and includes suggestions for one hundred and six studies, distributed throughout the vegetable kingdom. After three studies of living cells the student is started up the series beginning with *Pleurococcus, Merismopedia, Lyngbya,* etc., to *Closterium, Spirogyra, Vaucheria, Hydrodictyon, Cladophora, Fucus,* etc. Then follow *Mucor, Empusa, Saprolegnia* and *Plasmopara,* and after these *Chara* and *Polysiphonia.* Some higher fungi follow, as *Morchella, Uncinula, Ustilago, Puccinia, Fomes, Psalliota, Bovista,* with the lichen-fungi *Parmelia* to *Cladonia.* Following these are *Oedogonium* and *Coleochaete,* leading to *Riccia, Marchantia, Sphagnum, Polytrichum* and *Anthoceros.* He then takes up *Ophioglossum, Botrychium, Adiantum, Pteridium,* etc., and *Lycopodium* and *Selaginella,* finally reaching the seed plants, where he takes *Cycas, Ginkgo, Pinus,* etc. In the angiosperms he properly begins with *Sagittaria, Ranunculus* and *Alisma,* following with *Sedum, Trillium, Cypripedium, Catalpa, Cornus, Ageratum, Chrysanthemum* and *Taraxacum.* This is an admirably arranged series, and it brings out clearly the author's idea of the evolution of the vegetable kingdom, and the natural relationship of the various groups. The twenty histological studies and the pages on microtechnique will be useful to those who wish to give some time to the elements of cytology. The book might be introduced into many botanical laboratories with great profit to the students.

MORE PHILIPPINE PLANTS.

FROM the Bureau of Government Laboratories at Manila we have Bulletin 29, bearing date of September, 1905, and containing two papers, viz: (I.) 'New or Noteworthy Philippine Plants, III.,' and (II.) 'The Sources of Manila Elemi,' both by Elmer D. Merrill, botanist. In the first paper seventy-two new species are described, and twenty-seven hitherto described species are included and in some cases further described. Since many new species were described in bulletins 6 and 17 under the same title, a full index to all the species in the three bulletins is added for the convenience of botanists who may wish to consult them. The species of two genera are summarized, viz: *Medinella* (with 21 species) and *Rhododendron* (with 14 species). Of the former eleven species are new, and of the latter four.

THE NORTH AMERICAN FLORA.

UNDER date of December 18, 1905, Part 2 of Volume 22 of the 'North American Flora' was issued by the New York Botanical Garden. Eight families are monographed, viz: *Saxifragaceae* and *Hydrangeaceae* (by Dr. Small and Dr. Rydberg), *Cunoniaceae, Iteaceae* and *Hamamelidaceae* (by Dr. Britton), *Pterostemonaceae* (by Dr. Small), *Altingiaceae* (by Percy Wilson), and *Phyllonomaceae* (by Dr. Rusby). The family *Saxifragaceae*

is by far the largest of those treated in this part, having 255 species. In this family the largest genera are *Lithophragma* with 20 species; *Heuchera*, 72; *Therefon*, 10; *Saxifraga*, 7; *Muscaria*, 7; *Micranthes*, 56; *Spatularia*, 7, and *Leptasea*, 15. The next family in number of species is *Hydrangeaceae* with 52, and here the genus *Philadelphus* is the dominant one, with 36 species. Of the remaining families only *Cunoniaceae* and *Hamamelidaceae* have more than one species, the former having two and the latter four. The total number of species described in this part is 317, among which one finds a considerable number of new species.

Charles E. Bessey.

The University of Nebraska.

WORK AT THE LAKE LABORATORY FOR THE SEASON OF 1905.

The work in the past summer at the Lake Laboratory was, perhaps, the most successful of any session that has been spent there and distinctly encouraging for successful sessions in the future. Of the twenty-six students enrolled, eleven were college or university graduates; two having the title of Ph.D. and five that of master. Fifteen of the number were engaged in advanced or research work of university or graduate grade and in most cases for university credit; four were engaged in advanced work under the direction of the instructors, while six were doing independent research work for part or all of the time. Seven of the number are teachers in a university or college and two teachers in high schools, eleven being now or recently engaged in teaching in some capacity.

The following institutions were represented there this season: Cincinnati University, Columbia University, Denison University, De Pauw University, German Wallace College, Johns Hopkins University, Kenyon College, Ohio University, Ohio Northern University, Ohio State University, Ohio Wesleyan University and Miami University. If we include institutions which have been represented within the last few years we should add to these, Chicago, Michigan, Nebraska, Stanford, Amherst, Cornell, Antioch and Fargo, which have been represented either by investigators or by students.

A very enjoyable and profitable feature of this season's session was the meeting of the American Microscopical Society which brought a number of prominent scientific workers from various parts of the country and especially from Ohio, the Ohio Academy of Science holding a field meeting at the same time. This meeting consisted of the presentation of a number of scientific papers which were read at the laboratory and to which all the students were invited; an evening lecture by the president and social meetings, the most prominent of which was the luncheon which the university gave to the visiting members.

As heretofore, much attention has been given to original investigation and some of the more important topics studied this year are: 'The Brain of Amia,' by Professor Charles Brookover, Buchtel College; 'The Naididæ of Cedar Point,' by Professor L. B. Walton; 'Studies on the Life History of the Catfish and Investigations of Protozoa,' by Professor F. L. Landacre; 'Studies of the Insects which act as Scavengers of the Beach Débris,' by W. B. Herms; 'Correlation Studies of Toads,' by Professor W. E. Kellicott; 'On the Flora of Cedar Point,' by Otto E. Jennings, and on the 'Protozoa of Sandusky Bay,' by Miss L. C. Riddle. The results of some of these studies will appear in published papers in the near future; others will doubtless be continued for more complete results.

Herbert Osborn.

THE BRITISH ASSOCIATION.[1]

The list of officers for the seventy-sixth meeting of the British Association, which will open at York on August 1, next, is now practically completed. The meeting promises to be one of great interest. It was at York that the association came into being in 1831, when Lord Milton (afterward Lord Fitzwilliam) was president, and the attendance numbered only 353 persons. Thirteen years later the association again met in York, with the Rev. G. Peacock as president, and yet a third time

[1] The London *Times*.

in 1881, when the association met for the fifty-first time and celebrated its jubilee. Lord Avebury (then Sir John Lubbock) presided, and the growth of the association during the half-century was indicated by the attendance, which, though not the largest recorded during the interval, numbered 2,557 persons. When the association meets in York next summer for the fourth time it will have attained the respectable age of 75 years. The president-elect is Professor Ray Lankester, and the list of sectional presidents and vice-presidents, as now appointed by the council, is as follows:

Section A (Mathematical and Physical Science): President, Principal E. H. Griffiths; vice-presidents, Professor A. R. Forsyth and Professor H. L. Callendar.

Section B (Chemistry): President, Professor Wyndham Dunstan; vice-presidents, Mr. G. T. Beilby and Professor A. Smithells.

Section C (Geology): President, Mr. G. W. Lamplugh; vice-presidents, Professor H. A. Miers and Professor J. W. Gregory.

Section D (Zoology): President, Mr. J. J. Lister; vice-presidents, Mr. G. A. Boulenger and Mr. A. E. Shipley.

Section E (Geography): President, Sir George Taubman Goldie; vice-presidents, Dr. J. Scott Keltie and Major Close.

Section F (Economic Science and Statistics): President, Sir George S. Gibb; vice-presidents, Rev. Dr. W. Cunningham and Mr. Ashley.

Section G (Engineering): President, Mr. J. A. Ewing; vice-presidents, Sir Colin Scott Moncrieff and Mr. W. Cudworth.

Section H (Anthropology): President, Mr. E. Sidney Hartland; vice-presidents, Dr. A. C. Haddon and Mr. D. G. Hogarth.

Section I (Physiology): President, Professor Francis Gotch; vice-presidents, Colonel D. Bruce and Dr. Bevan-Lewis.

Section K (Botany): President, Professor F. W. Oliver; vice-presidents, Mr. Harold Wager and Dr. D. H. Scott.

Section L (Educational Science): President, Professor M. E. Sadler; vice-presidents, Mr. Grant Ogilvie, Sir Philip Magnus, M.P., and Mr. Dyke-Acland.

As regards the medal fund which was started last year to commemorate the visit of the British Association to South Africa, it is proposed to call a meeting of the subscribers to be held on March 2, for the purpose of receiving the report of the executive committee. We understand that subscriptions have been promised to the amount of over £700, and since the council of the association has resolved to add to the fund the balance of the special funds raised to meet the expenses of the South Africa meeting, the total sum to be disposed of is between £1,500 and £1,600. Finished sketches of obverse and reverse designs for the proposed medal have been prepared by Mr. F. Bowcher, and will be laid before the subscribers by the executive committee. The committee's report, of which the adoption will be moved by Sir George Darwin, the president of the South Africa meeting, recommends that the fund, together with a die for the medal, be offered to the president and council of the British Association for transmission to South Africa, there to be held in trust by the South African Association for the Advancement of Science. It is proposed that the medal, struck in bronze, together with the balance of the income on the fund after paying for the medal, shall be awarded 'for achievement and promise in scientific research in South Africa,' and that as far as circumstances shall allow, the award shall be made annually.

SCIENTIFIC NOTES AND NEWS.

WE regret to learn that Dr. S. P. Langley, secretary of the Smithsonian Institution, died on February 27.

SIR WILLIAM CROOKES has been elected a corresponding member of the physical section of the Paris Academy of Sciences in succession to the late M. Bichat.

ST. ANDREWS UNIVERSITY has conferred the degree of LL.D. on Dr. Albert C. L. G. Gunther, of London, the well-known authority on reptiles and birds.

THE Geological Society of London, at its annual meeting on February 16 elected the following officers: *President,* Sir Archibald

Geikie; *Vice-presidents,* R. S. Herries, J. E. Marr, A. Strahan and J. I. H. Teall; *Secretaries,* W. W. Watts and E. J. Garwood; *Foreign Secretary,* Sir John Evans; *Treasurer,* H. W. Monckton. This is the second occasion on which Sir Archibald Geikie fills the presidential chair. He has been specially elected in view of the approaching centenary of the society.

We learn from *Nature* that a portrait of Dr. H. C. Sorby, F.R.S., subscribed for privately, and presented by the subscribers to the University of Sheffield, in commemoration of Dr. Sorby's scientific work and labors as one of the founders of the university, was unveiled on February 12. Dr. Sorby was unable to be present at the ceremony, but he expressed his appreciation of the honor in a letter to Alderman Franklin. The portrait is a replica of one painted by Mrs. M. L. Waller, now hanging in the rooms of the Sheffield Literary and Philosophical Society.

Mr. Edward K. Putnam, instructor in English in Stanford University, has resigned to become trustee for the Putnam Memorial Fund for the Davenport Academy of Sciences. His brother, Mr. W. C. Putnam, bequeathed more than $500,000 to the academy.

Nature states that Dr. Lewis Gough has been appointed to assist Dr. Gunning in the management of the museum at Pretoria. The department for which he will be responsible will be that containing the fishes, the amphibia and reptiles—groups of animals which were especially under his charge when he was an assistant in the museum at Strasburg. Recently Dr. Gough has been working at Plymouth on the plankton of the British Channel in connection with the British Marine Biological Association.

Dr. J. P. Lotsy has been made director of the National Herbarium in Leyden.

Professor Zimmermann, director of the Agricultural Station at Amani, German East Africa, has been appointed director of the Agricultural Station in Salatiga, Java.

The tenth lecture in the Harvey Society course was delivered by Professor Charles S. Minot, of the Harvard Medical School, at the New York Academy of Medicine, on February 24, on 'The nature and cause of old age.' The eleventh lecture in the course will be delivered by Professor J. C. Webster, of Rush Medical College, on Saturday, March 3, at 8:30 P.M., on 'Modern views regarding placentation.'

Dr. James Ward, professor of mental philosophy in the University of Cambridge, will deliver in the sessions of 1906, 1907 and 1908, the Gifford lectures at St. Andrews. Dr. Ward was Gifford lecturer at Aberdeen in 1895–1897. The subject of his Gifford lectures at St. Andrews will be 'The realm of ends.'

A memorial tablet has been unveiled at the house at Eisenach, in which the late Professor C. Abbe, the optician, was born.

A bust of Liébault, founder of the Nancy School of Psychotherapy, was unveiled on February 8 in the Ecole de Psychologie, Paris.

Plans are being made to erect in Munich a monument in memory of the late Professor A. Hilger, professor of pharmacy in the university.

It is proposed to erect a monument in honor of the late Eduard Grimaux, the chemist, in Rochefort-sur-Mer, his native town.

The death is announced of Dr. H. Rittenhausen, professor of agricultural chemistry in the University of Königsberg; of Dr. Alexander Popow, professor of physics in the Electro-technical Institute at St. Petersburg, and of Dr. Karl v. Koristka, professor of geodesy in the Technical Institute at Prague.

The fourth annual conference of the Colleges of the Interior was held on February 21 and 22 at Colorado College, Colorado Springs. This conference represents twenty-six colleges, with about 10,000 students.

Physicians of Toronto, representing the local branch of the British Medical Association, appeared February 7 before the premier and the provincial cabinet to ask for assistance in entertaining the association next August, $7,500 being the amount requested. The dominion government has partially promised $10,000, and the city of Toronto is expected to contribute $5,000.

THE forty-fourth Congrès de sociétés savantes will be held at the Sorbonne, Paris, from April 17 to 20.

THE second congress of the German Röntgen Society will be held at Berlin on April 1 and 2, under the presidency of Professor Eberlein.

THE Queensland branch of the Royal Geographical Society of Australia proposes to celebrate its twenty-first anniversary in June. Arrangements are being made for the delivery of a series of special addresses by eminent authorities on geographical science.

THE Warren triennial prize will be awarded for researches on some special subject in physiology, surgery or pathology. Dissertations should be presented not later than April 14, 1907. The prize was founded by the late Dr. J. Mason Warren in memory of his father. The judges are the physicians and surgeons of the Massachusetts General Hospital. The amount of this prize for the year 1907 will be $500.

SEVERAL changes have recently been made in the American board of editors of the *Botanische Centralblatt;* Dr. E. C. Jeffrey and Dr. George T. Moore having resigned on account of pressure of other work. In their places there have been appointed Dr. M. A. Chrysler, of Harvard University, who will review papers on morphology and Dr. William R. Maxon, of the United States National Museum, who will review papers on archegoniates and algae. Botanists are requested to note these changes and to send separates of their papers to the respective editors so that they may be reviewed at the earliest possible date.

PRESIDENT ROOSEVELT has issued under date of February 10 the following executive order: It is hereby ordered that Indian Key, an island in Tampa Bay, Florida, containing ninety acres, and located in sections 10 and 15, township 32 south, range 16 east, as the same appears upon the official plat of survey of said township on file in the General Land Office, be, and it is hereby reserved and set apart for the use of the Department of Agriculture as a preserve and breeding ground for native birds. This reservation to be known as Indian Key Reservation.

UNIVERSITY AND EDUCATIONAL NEWS.

MRS. A. A. ANDERSON has given $100,000 to Barnard College, Columbia University, toward the establishment of a course in science leading to the degree of bachelor of science.

THE New York *Evening Post* states that a movement has been started to increase the salaries of professors at Pennsylvania. The gift of $50,000 made recently by Eckley Brinton Coxe, Jr., is to be used for this purpose. The fund itself was invested in a dormitory, and the income is to be applied to the purpose designated by Mr. Coxe.

IT is now virtually assured that Swarthmore College will receive the conditional gift of $50,000 from Mr. Andrew Carnegie for a library building. Mr. Isaac H. Clothier has started the subscription for the additional fund required with $10,000; Mr. Joseph Wharton, president of the board of managers, has also subscribed $10,000 and two other friends of the college have indicated their willingness to contribute liberally. Mr. Morris L. Clothier, class of '90, has offered to assume the responsibility of raising the remainder of the $50,000 required.

During the month preceding the holiday vacation, Oberlin College received in gifts and bequests about $145,000. For the last few years the college has been engaged in raising a fund of half a million dollars. This is now almost complete. The fund was started by an anonymous donor of Boston who promised $100,000. At the time of the trustees' meeting in November the fund had reached $335,000. Since then the following gifts have been made: $5,000 for library endowment, by C. M. Hall, of New York; $2,000 by members of the trustees for additions to the women's gymnasium; $5,000 each, by A. C. Bartlett and Miss Grace Sherwood, of Chicago, toward a men's building; $33,000 from the estate of Dr. C. N. Lyman, of Wadsworth, O., which will be devoted to library endowment; $75,000 by Miss Anne Walworth, of Cleveland, to be

used as endowment for the Slavic Department of the seminary; $10,000 from her estate, for the same purpose; $10,000 from the estate of Mrs. Helen G. Coburn, of Boston, for library endowment, and $5,000 from an anonymous donor for the art building. In the total of $485,000 thus raised is counted $125,000, promised by Mr. Carnegie for a library, on condition that $100,000 be raised for library endowment. To complete the fund, therefore, it will be necessary for the college to raise about $50,000 more. It is expected that this will be done before commencement.

A MEETING of the alumni of the University of Maryland was held on February 21 to prepare for the celebration in May, 1907, of the one hundredth anniversary of the medical department.

THE University of Wisconsin experiment station has established three experimental farms in northern Wisconsin. This step is the beginning of a system of experimental farms at various points in which typical conditions for the different agricultural areas of the state may be studied. Beside the investigation side of the work these farms will make possible the practical demonstration to the farmers of the surrounding country of the principles worked out at the central station at Madison.

THE second session of the Graduate School in Agriculture under the auspices of the Association of American Agricultural Colleges and Experiment Stations will be held at the University of Illinois, Urbana, Illinois, beginning July 2, 1906, continuing four weeks. The school is under the charge of Dr. A. C. True, director of the Office of Experiment Stations, Washington, D. C. About one fourth of the instruction will be given by investigators connected with the Illinois Experiment Station, and about three fourths will be given by those connected with agricultural education and research in other American institutions. It is the purpose of this school to bring to the attention of the students the recent developments in agricultural science. Accordingly the attendance is limited to graduates of agricultural colleges or graduates of other colleges with special experience in agriculture. Communications regarding courses of study should be addressed to Dr. A. C. True, Office of Experiment Stations, Washington, D. C.; those relating to attendance or registration should be addressed to E. Davenport, registrar, Urbana, Illinois.

The Spectator says: "The final report of the departmental committee on the Royal College of Science has been issued. It will be remembered that this committee, under the chairmanship first of Sir Francis Mowatt and then of Mr. Haldane, has been considering for the past two years some comprehensive scheme to provide advanced scientific instruction and research, especially in its application to industry. We have not space to do more than summarize the main results. It is proposed to establish at South Kensington an institution, or group of associated Colleges of Science and Technology. The Royal College of Science, the School of Mines and the Central Technical College will come into the scheme. The government will contribute the existing buildings and an annual grant of £20,000, the London County Council is prepared to contribute a similar amount, and a capital sum of £100,000 has been offered by the firm of Messrs. Wernher, Beit and Co. for initial equipment. The report provides for a governing body of forty members to begin with, of whom ten shall be government nominees, and five each appointed by the University of London, the London County Council, and the Council of the City and Guilds Institute. These will act as the first management authority, and discuss the further details of organization. It is an admirable and most needful scheme, and we trust that no time will be lost in putting it into operation."

DR. CLARENCE A. SKINNER, assistant professor of physics at the University of Nebraska, has been made head of the department in succession to the late D. B. Brace.

AT Wellesley College, Miss Margaret Ferguson has been promoted to a professorship of botany, and Miss Elizabeth F. Fisher to be associate professor of geology and mineralogy.